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Classified Document Master Control Station, NASA
Scientific and Technical Information Facility

Total Pages 187

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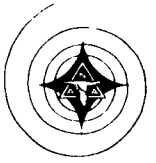
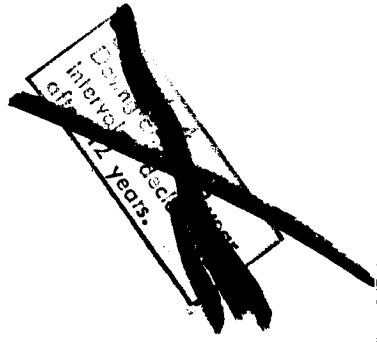
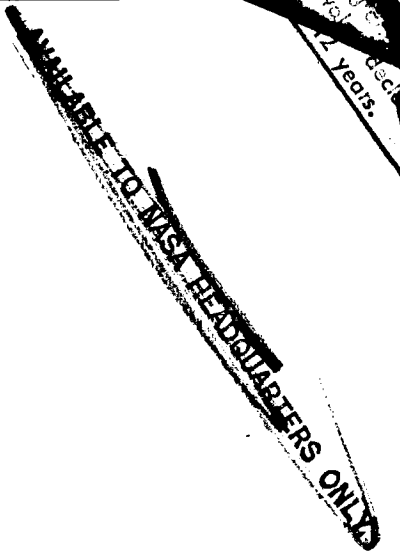
AP 62-13

APOLLO THIRD QUARTERLY REPORT [redacted]

October 1962







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NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

[redacted]

FORM M158-D-6 LEDGER REV. 2-61

CONTENTS

	File No.
Apollo Program Management	19872
Apollo Division - June '62	19749
Apollo Division - Sept '62	19748
Apollo Program Funding and Expenditure Status Including Fee	22079A
Apollo Manpower Load	22080A
Completed Major Milestones	19882
Completed Milestones	19874
Schedule Comparison	19875
Major Milestone Reference Points	19884A
Mockup Manufacturing Completions	19876
Major Hardware Trainer Manufacturing Completions	19877
Manufacturing Completion Dates - Boilerplates	22081A
Manufacturing Completion Dates - Spacecraft	22082A
Number of Major Hardware Items vs Time	22238
Pert Accomplishments	19878A
Pert Future Actions	19880
PMP Position	19879
PMP Position	19883
Apollo Mfg Progress Report through 30 Sept 1962	18842
Manpower Acquisition	18845A
Personnel Training	18846A
Tooling Summary	18849A
Manufacturing Completion Summary	18853A
Apollo Facilities Third Quarterly Progress Report	19893
Apollo Facilities Status	19894
Apollo Facilities Status	19895
Apollo Facilities Status	19896

	File No.
Accomplishments - Subcontractors	19898
Accomplishments - Other	19897A
Major Facilities Funds Status - Cumulative White Sands Only - (Contract No. 9-627)	19899
Major Facilities Funds Status - Cumulative Downey Only (Contract No. 7-90)	19900
Future Acitvities - Downey Facilities	19901
Future Activities - WSMR	19902
Future Acitivties - Subcontractors	19903
Apollo Material Department Quarterly Progress Report - Sept 1962	19852
Manufacturing Completion Summary	18853A
Previous Commitments for Third Quarterly and Performance	19855
Internal	19857
Dollars Committee	19859
Items to be Placed	19860
Service Propulsion Engine - Aerojet	19861A
Environmental Control System - Airesearch	19862A
Launch Escape Motor - Lockheed	19863A
Heat Shield - Avco	19864A
Earth Landing System - Northrop-Ventura	19865A
Telecommunications - Collins	19866A
Fuel Cells - Pratt & Whitney	19867A
Reaction Control Engine - Marquardt	19868A
Tower Jettison Motor - Thiokol	19869A
Stabilization and Control - Minneapolis-Honeywell	19870A
Items to be Accomplished	19871
Quality Control - Apollo Quality Activities	19726
Quality Control - Apollo Supplier Surveys & QC Reps	19721
Quality Control - Apollo Skill Certification Requirements	19720
Apollo Test and Operations	19984
Missions	19985
Organization	19982

	File No.
ATO Programs	19983
Major Accomplishments	19986
Future Accomplishments	22239
Logistics Responsibilities	19729
Logistics Activity 3rd Quarter	22237
Logistics Activities in 4th Quarter	19740A
Future Major Milestones (Next Quarter)	19873
Apollo	11749C
Mission Redefinition	22136
Accomplishments	22124
Accomplishments (Cont)	22125
Technology Outline	22136
ΔV	19993
Characteristic Velocities	22038
Definitions	22005
Typical Variation of Circular Orbit Injection Requirements	22027
Transearth Entry Loci	22136
Typical Variation of Transearth Injection Requirements	22026
Yearly Variation of ΔV Requirements	22025
S/M Sizing	19992
Service Module Sizing	22024A
Propellant Capacity Tradeoffs	22023A
Current Design and Performance	22022A
SCS	19991
SCS Modes	22021
Monitor Mode	22013
G&N Attitude Mode	22014
SCS Attitude Mode	22016
SCS Local Vertical Mode	22015
G&N ΔV Mode	22017
SCS ΔV Mode	22018
G&N Entry Mode	22018

	File No.
SCS Entry Mode	22020
Entry	19990
Transearth Injection Constraints	22012
Entry Conics	22011
Entry Corridor	22010
Corridor Limits	22009
Corridor Requirements	22008
Footprint	22007A
L/D	19989
Exo-Atmospheric	22006
Command Module Aerodynamics	22004
Normal Entry	22160
Effect of CG Position on Entry L/D	22128
CG	19988
Structure and Fixed Equipment	22135A
Equipment Reduction and Relocation	22134A
Three Couch Positions	22130
Apollo Command Module 8740-LB Configuration	22133A
Aerodynamic Testing	19987
Wind Tunnel Test Hours	22002
Test Facilities	22001
Aerodynamic Simulation	22000
Aero/Thermo Simulation	19999
Aero Heating Wind Tunnel Program	22131
Comparison of Aero Heating Tests	22129
Structural Dynamics Model	19998
Transient Pressure Model	19997
Fluctuating Pressure Tests	19994
Typical Spectrum	19996
Transient Pressure Results	19995
Jet Effects Model	22137
Design	22055

	File No.
Status Summary	22153
Launch Escape System	22056
LES CONFIGURATION	22059A
Launch Escape and Pitch Control Motors - Lockheed	22058
Tower Jettison Motor - Thiokol	22057
Service Propulsion Engine	22060
Service Propulsion Engine Optimization	22061
Service Propulsion Engine Configuration	22062
Service Propulsion Engine - Aerojet	22064
Reaction Control System	22065
C/M Entry Heating Problem	22066
C/M RCS Engine Configuration	22067
C/M RCS Engine - Rocketdyne	22068
S/M RCS - Marquardt	22069
Environmental Control System	22070
Environmental Control System	22071
ECS - Airesearch	22118
Cryogenic Gas Storage System - Beech	22075A
Fuel Cell - Pratt & Whitney	22119
Communication Systems	22073
Communication System	22072
Telecommunications - Collins	22110
Stabilization and Control	22078
SCS Functional Block Diagram	22111
SCS - Minneapolis-Honeywell	22112
Heat Shield and Recovery	22077A
Ablator Thickness Requirements	22076
Heat Shield - AVCO	22113
Parachute Subsystem - Northrop Ventura	22117
Design Considerations Space Environment	22114
C/M Temperatures - Space Environment	22115
S/M Temperatures	22154

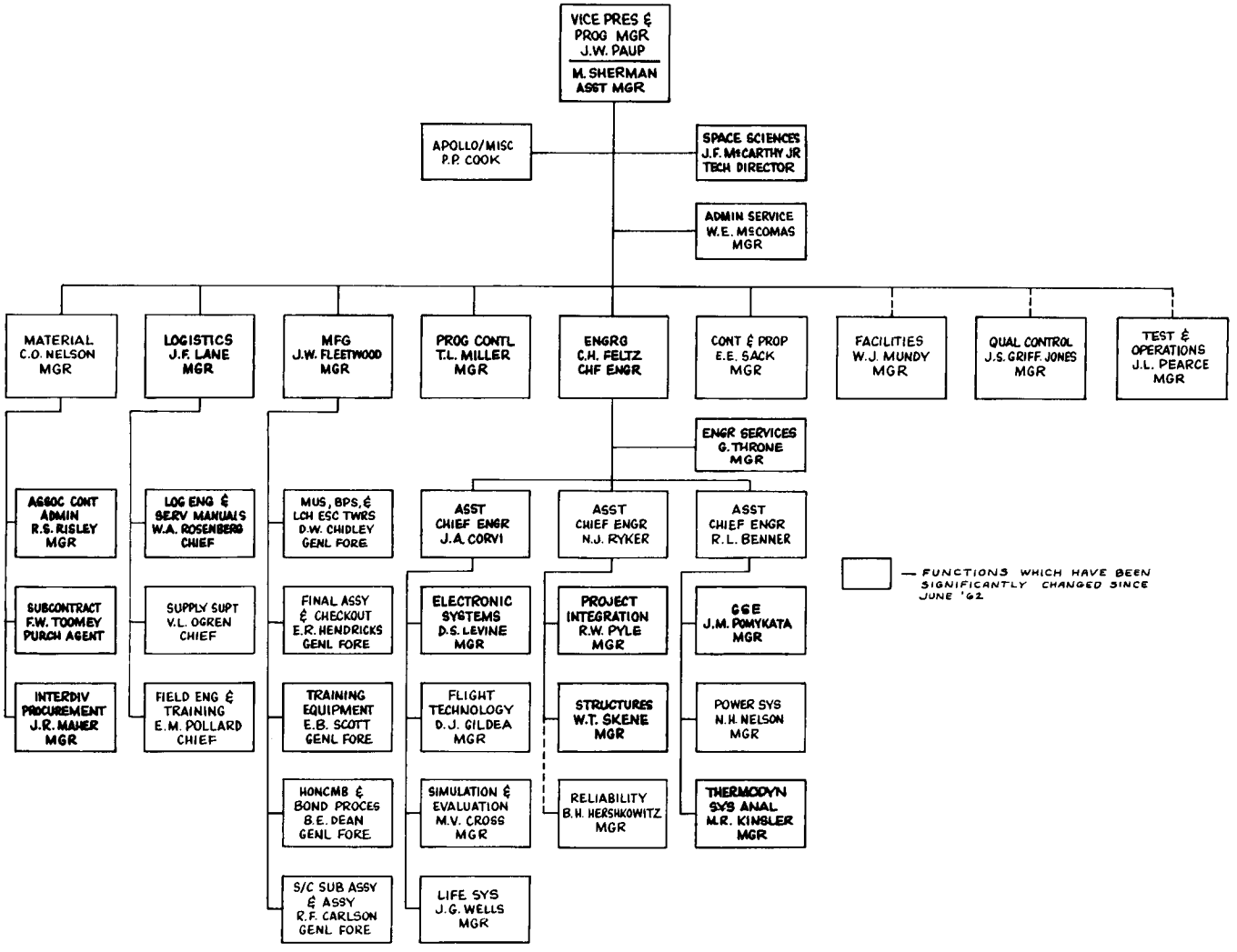
File No.

Radiator Coating Evaluation - OSO Test	22116
Integration	22215
Outline	22216
Configuration	22029
Apollo Spacecraft	22030
Command Module	22031
External Visibility	22033
Forward Visibility	22034
C/M Inner Structure	22035
S/M Structural Configuration	22036
Weight Status	22037
Weight Status	22217
Weight History	22109
Project Testing	22041
Parachute Drop-Test Summary	22042
B/P Test Results	22043
Reliability	22048
Reliability Demonstration Program	22050
Interfaces	22044
C-1 Block II Coordination	22045A
Tasks Underway	22051
Tasks Underway	22052
Tasks Underway	22053
Tasks Underway	22054

APOLLO PROGRAM MANAGEMENT

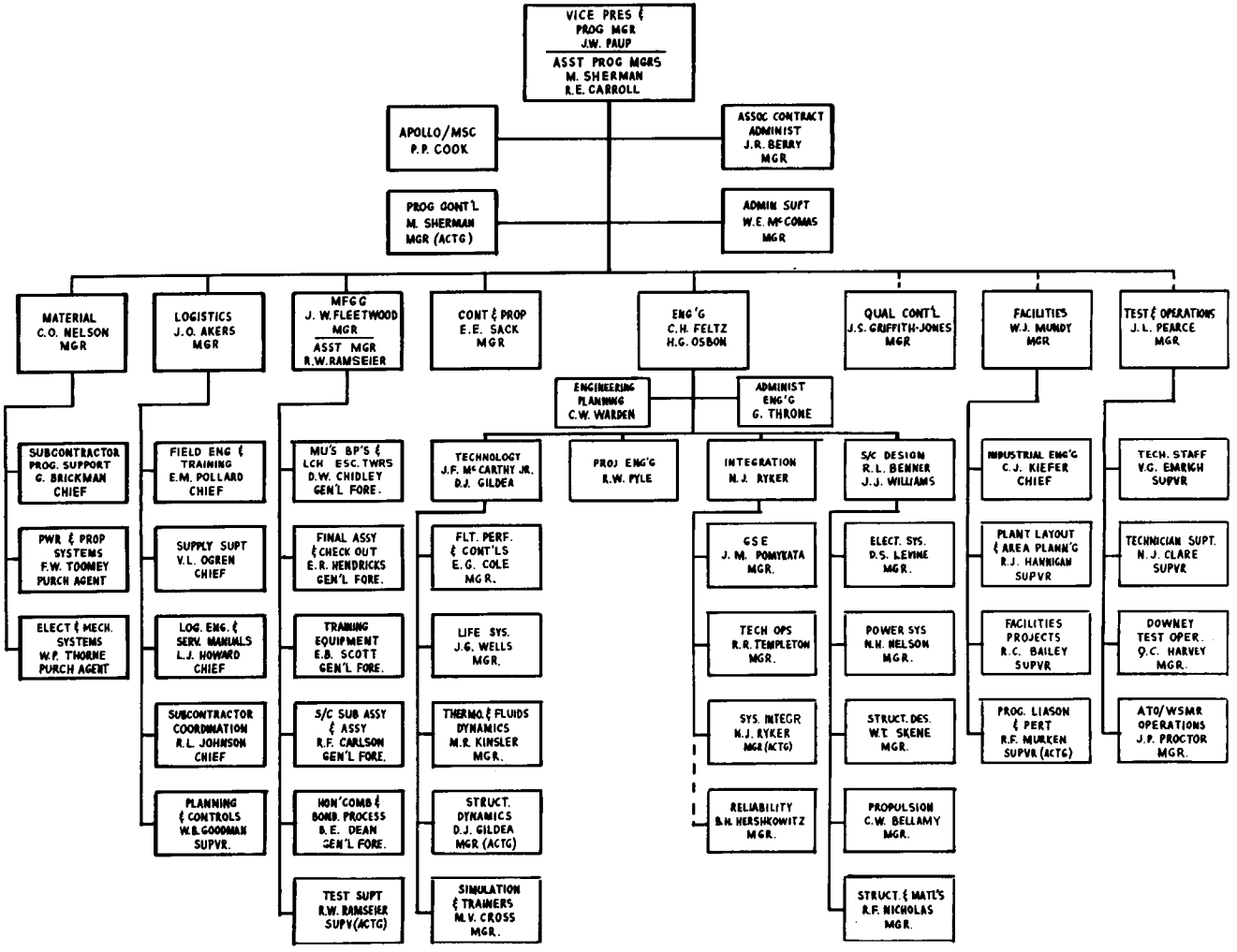
10-62 AP 19872

APOLLO DIVISION - JUNE '62


VICE PRES & PROG MGR J.W. PAUP
M. SHERMAN ASST MGR
APOLLO/MISC P.P. COOK
SPACE SCIENCES J.F. McCARTHY JR TECH DIRECTOR
ADMIN SERVICE W.E. McCOMAS MGR
MATERIAL C.O. NELSON MGR
LOGISTICS J.F. LANE MGR
MFG J.W. FLEETWOOD MGR
PROG CONTL T.L. MILLER MGR
ENGRG C.H. FELTZ CHF ENGR
CONT & PROP E.E. SACK MGR
FACILITIES W.J. MUNDY MGR
QUAL CONTROL J.S. GRIFF JONES MGR
TEST & OPERATIONS J.L. PEARCE MGR
ENGR SERVICES G. THRONE MGR
ASST CHIEF ENGR J.A. CORVI
ASST CHIEF ENGR N.J. RYKER
ASST CHIEF ENGR R.L. BENNER
ASSOC CONT ADMIN R.S. RISLEY MGR
SUBCONTRACT F.W. TOOMEY PURCH AGENT
INTERDIV PROCUREMENT J.R. MAHER MGR
LOG ENG & SERV MANUALS W.A. ROSENBERG CHIEF
SUPPLY SUPT V.L. OGREN CHIEF
FIELD ENG & TRAINING E.M. POLLARD CHIEF
MUS, BPS, & LCH ESC TWRS D.W. CHIDLEY GENL FORE
FINAL ASSY & CHECKOUT E.R. HENDRICKS GENL FORE
TRAINING EQUIPMENT E.B. SCOTT GENL FORE
HONCMB & BOND PROCES B.E. DEAN GENL FORE
S/C SUB ASSY & ASSY R.F. CARLSON GENL FORE
ELECTRONIC SYSTEMS D.S. LEVINE MGR
FLIGHT TECHNOLOGY D.J. GILDEA MGR
SIMULATION & EVALUATION M.V. CROSS MGR
LIFE SYS J.G. WELLS MGR
PROJECT INTEGRATION R.W. PYLE MGR
STRUCTURES W.T. SKENE MGR
RELIABILITY B.H. HERSHKOWITZ MGR
GSE J.M. POMYKATA MGR
POWER SYS N.H. NELSON MGR
THERMODYN SYS ANAL M.R. KINSLER MGR
— FUNCTIONS WHICH HAVE BEEN SIGNIFICANTLY CHANGED SINCE JUNE '62

9-62 AP 19749

APOLLO DIVISION - SEPT '62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APOLLO/MSC P.P. COOK
ASSOC CONTRACT ADMINIST J.R. BERRY MGR.
PROG CONT'L M. SHERMAN MGR (ACTG)
ADMIN SUPT W.E. McCOMAS MGR
MATERIAL C.O. NELSON MGR
LOGISTICS J.O. AKERS MGR
MFG'G J.W. FLEETWOOD MGR
ASST MGR R.W. RAMSEIER
CONT & PROP E.E. SACK MGR
ENG'G C.H. FELTZ H.G. OSBON
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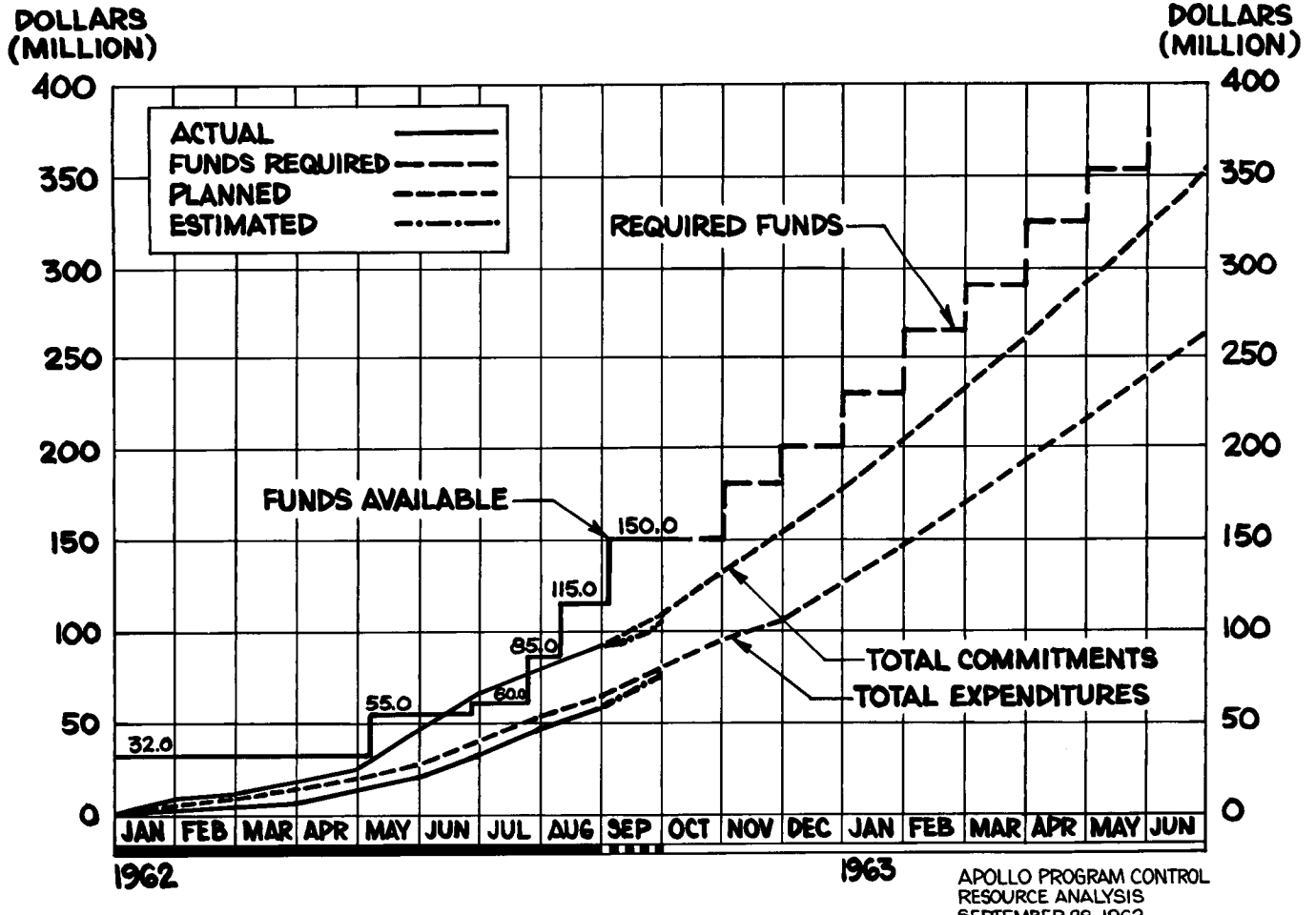
FACILITIES W.J. MUNDY MGR
TEST & OPERATIONS J.L. PEARCE MGR
ENGINEERING PLANNING C.W. WARDEN
ADMINIST ENG'G G. THRONE
SUBCONTRACTOR PROG. SUPPORT G. BRICKMAN CHIEF
PWR & PROP SYSTEMS F.W. TOOMEY PURCH AGENT
ELECT & MECH. SYSTEMS W.P. THORNE PURCH AGENT
FIELD ENG & TRAINING E.M. POLLARD CHIEF
SUPPLY SUPT V.L. OGREN CHIEF
LOG. ENG. & SERV. MANUALS L.J. HOWARD CHIEF
SUBCONTRACTOR COORDINATION R.L. JOHNSON CHIEF
PLANNING & CONTROLS W.B. GOODMAN SUPVR.
MU'S BP'S & LCH ESC. TWRS D.W. CHIDLEY GEN'L FORE.
FINAL ASSY & CHECK OUT E.R. HENDRICKS GEN'L FORE.
TRAINING EQUIPMENT E.B. SCOTT GEN'L FORE.
S/C SUB ASSY & ASSY R.F. CARLSON GEN'L FORE.
HON'COMB & BOND. PROCESS B.E. DEAN GEN'L FORE.
TEST SUPT R.W. RAMSEIER SUPV (ACTG)
TECHNOLOGY J.F. McCARTHY JR. D.J. GILDEA
PROJ ENG'G R.W. PYLE
INTEGRATION N.J. RYKER
S/C DESIGN R.L. BENNER J.J. WILLIAMS
INDUSTRIAL ENG'G C.J. KIEFER CHIEF
PLANT LAYOUT & AREA PLANN'G R.J. HANNIGAN SUPVR
FACILITIES PROJECTS R.C. BAILEY SUPVR
PROG. LIASON & PERT R.F. MURKEN SUPVR (ACTG)
TECH. STAFF V.G. EMRICH SUPVR
TECHNICIAN SUPT. N.J. CLARE SUPVR
DOWNEY TEST OPER. Q.C. HARVEY MGR.
ATO/WSMR OPERATIONS J.P. PROCTOR MGR.
FLT. PERF. & CONT'LS E.G. COLE MGR.
LIFE SYS. J.G. WELLS MGR.
THERMO. & FLUIDS DYNAMICS M.R. KINSLER MGR.
STRUCT. DYNAMICS D.J. GILDEA MGR (ACTG)
SIMULATION & TRAINERS M.V. CROSS MGR.
GSE J.M. POMYKATA MGR.
TECH OPS R.R. TEMPLETON MGR.
SYS. INTEGR N.J. RYKER MGR (ACTG)
RELIABILITY B.H. HERSHKOWITZ MGR.
ELECT. SYS. D.S. LEVINE MGR.
POWER SYS N.H. NELSON MGR.
STRUCT. DES. W.T. SKENE MGR.
PROPULSION C.W. BELLAMY MGR.
STRUCT. & MATL'S R.F. NICHOLAS MGR.

9-62-AP 19748

APOLLO PROGRAM FUNDING & EXPENDITURE STATUS
INCLUDING FEE

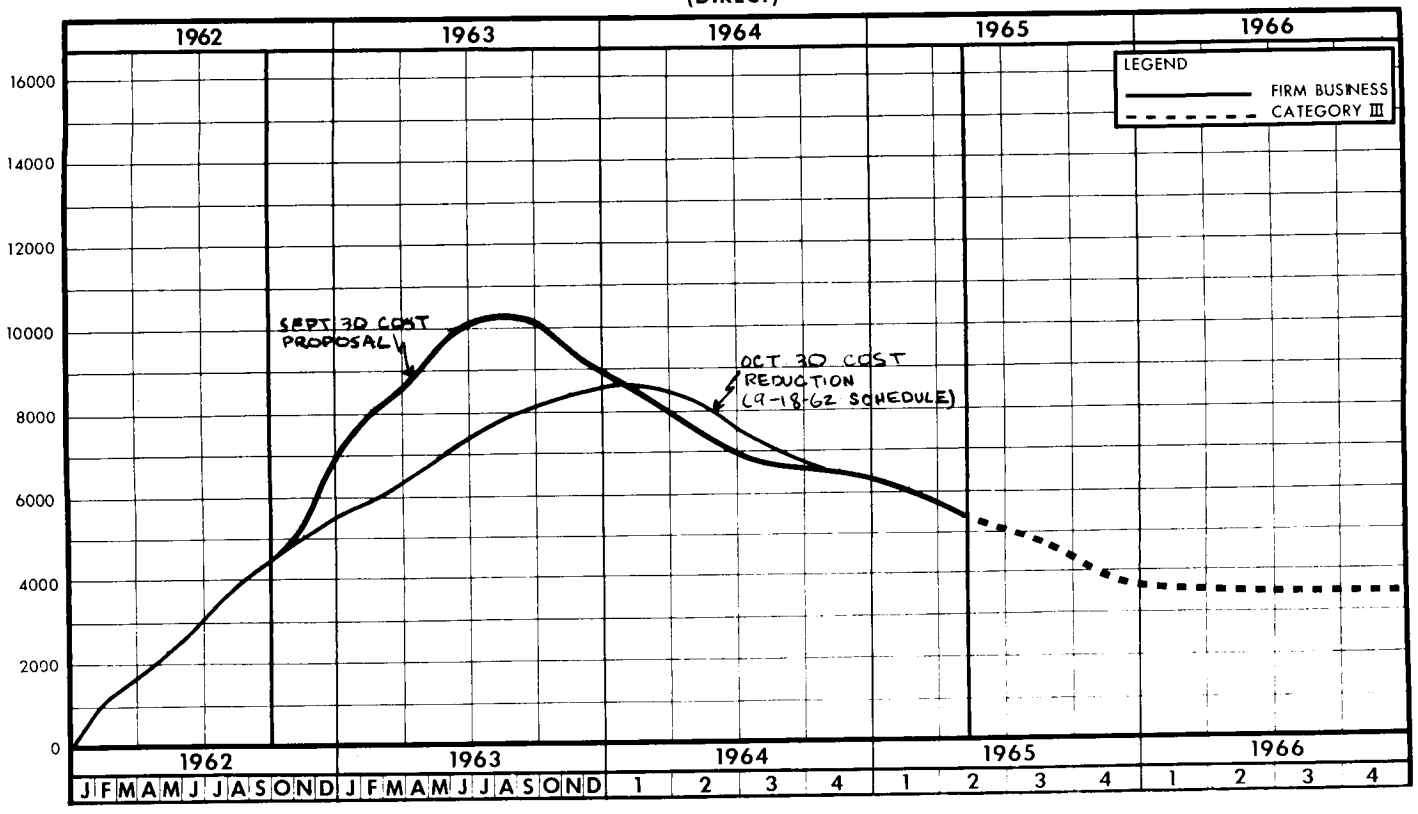


APOLLO PROGRAM CONTROL
RESOURCE ANALYSIS
SEPTEMBER 28, 1962

10-62 AP 22079 A

APOLLO MANPOWER LOAD

(DIRECT)



10-62 AP 22080A

COMPLETED MAJOR MILESTONES

• MOCK UPS 7, 5, 4 COMPLETE	15 JUN
• GUIDANCE & NAVIGATION PERFORMANCE SPEC SUBMITTED	21 JUN
• S/M PROP ENGINE TEST PLAN REVIEW	29 JUN
• PARA BOMB DROP TESTS START (7 TESTS COMPLETE BY 30 SEP)	30 JUN
• FLIGHT OPERATIONS MANUAL	2 JUL
• NASA FURNISHED R&D COMMUNICATIONS EQUIPMENT REQUIREMENTS	6 JUL
• 1ST LAUNCH VEHICLE INTERFACE REPORT	13 JUL
• PRELIM C/M WIND TUNNEL TESTS	20 JUL
• SUPERCRITICAL GAS STORAGE SUPPLIER SELECTED	17 JUL

10-62 AP 19882

COMPLETED MILESTONES

- 100% DES RELEASE LES, STRUCT & MOTOR 20 AUG
- STRUCTURAL ASSY C/M BP NO. 1 24 AUG
- 100% DESIGN RELEASE BP NO. 9 C/M 31 AUG
- BP NO. 1 FABRICATION COMPLETE 7 SEP
- M/U NO. 3, CABIN INTERIOR, TO NASA 10 SEP
- LAND & WATER IMPACT TESTS STARTED 24 SEP
- ACCEPTANCE BP NO. 25 BY NASA 8 AUG
- COMPLETE FLOTATION TESTS BP NO. 25 7 AUG

SCHEDULE COMPARISON

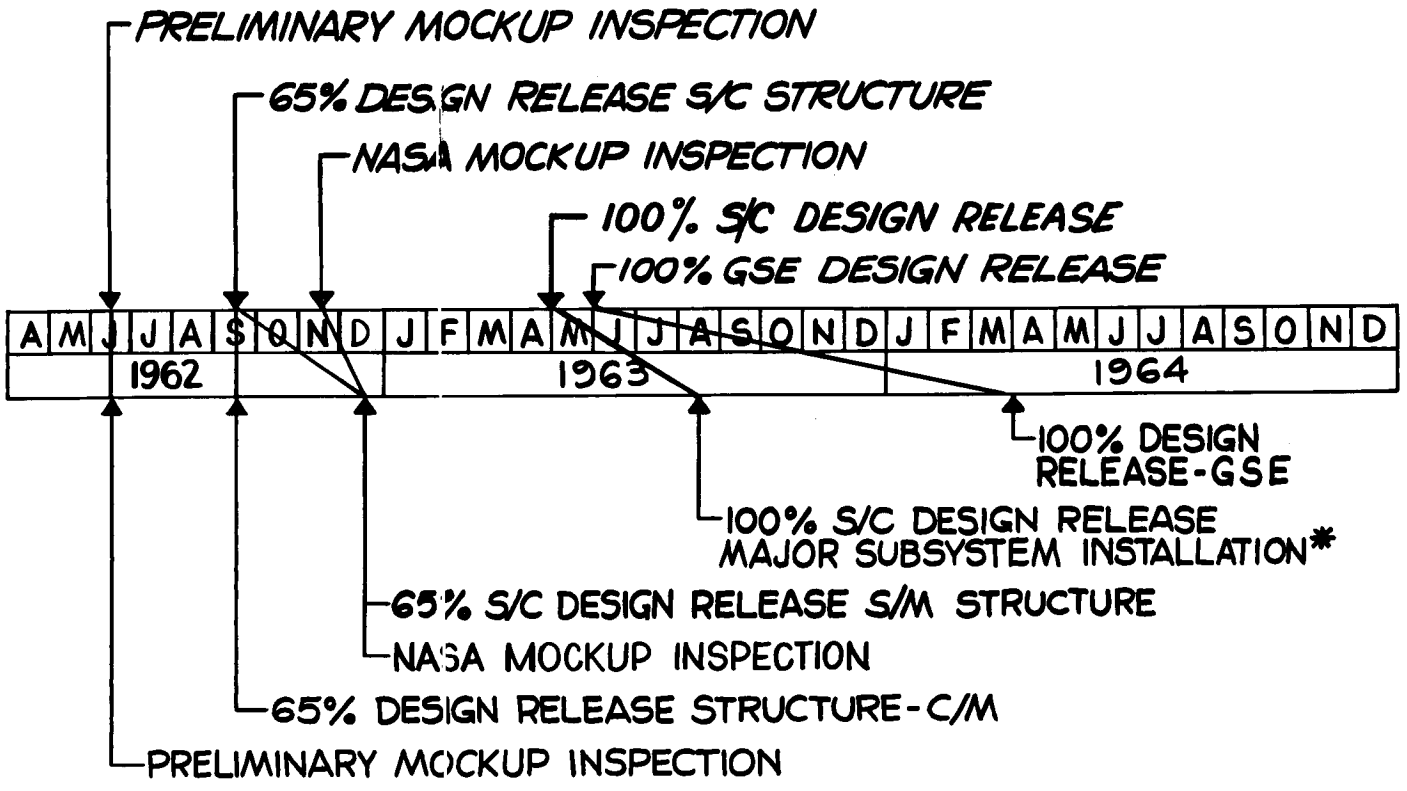
MASTER PHASING PLAN

RED—27 APR 1962

BLACK—18 SEP 1962

10-62 AP 19875

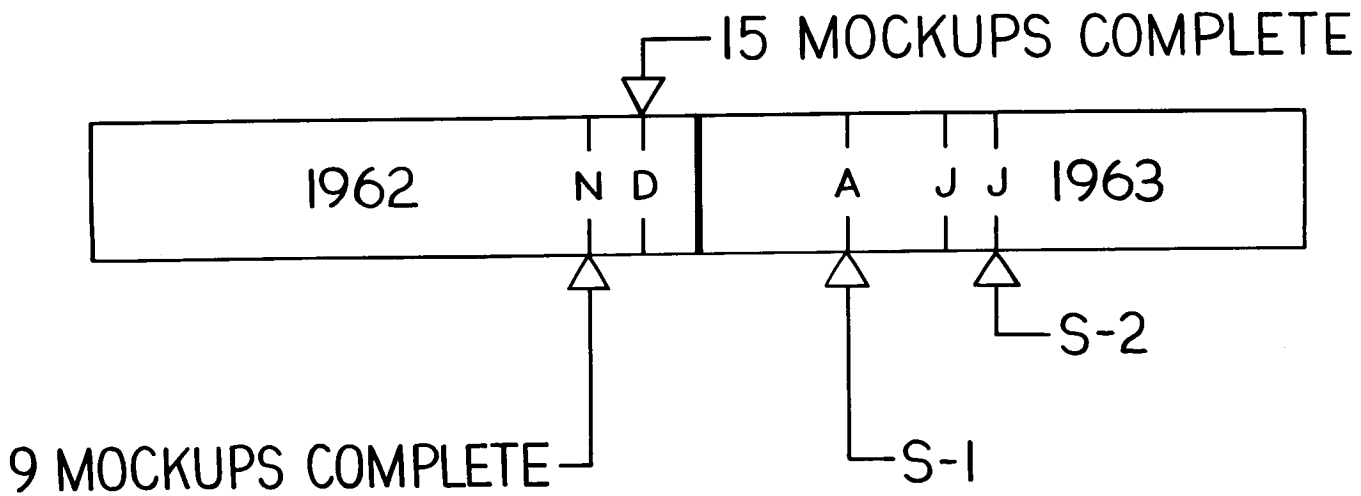
MAJOR MILESTONE REFERENCE POINTS


PRELIMINARY MOCKUP INSPECTION
65% DESIGN RELEASE S/C STRUCTURE
NASA MOCKUP INSPECTION
100% S/C DESIGN RELEASE
100% GSE DESIGN RELEASE
A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1962
1963
1964
100% DESIGN RELEASE-GSE
100% S/C DESIGN RELEASE MAJOR SUBSYSTEM INSTALLATION*
65% S/C DESIGN RELEASE S/M STRUCTURE
NASA MOCKUP INSPECTION
65% DESIGN RELEASE STRUCTURE-C/M
PRELIMINARY MOCKUP INSPECTION

RED-27 APRIL 1962 SCHEDULE
BLACK-18 SEPT 1962 SCHEDULE
* DOES NOT INCLUDE: NAV & GUIDANCE INSTAL, INSTRUMENTATION INSTAL

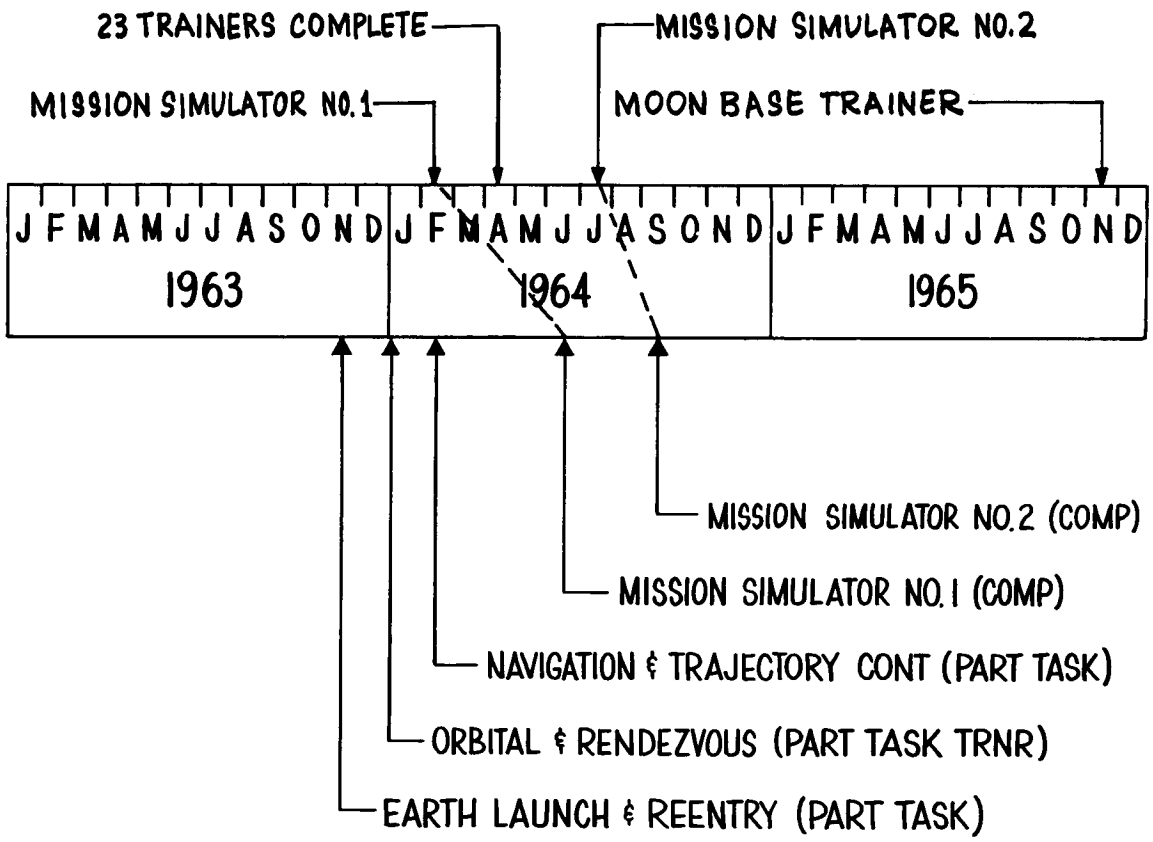
10-62 AP19884 A

MOCKUP MANUFACTURING COMPLETIONS



10-62 AP 19876

MAJOR HARDWARE TRAINER MANUFACTURING COMPLETIONS

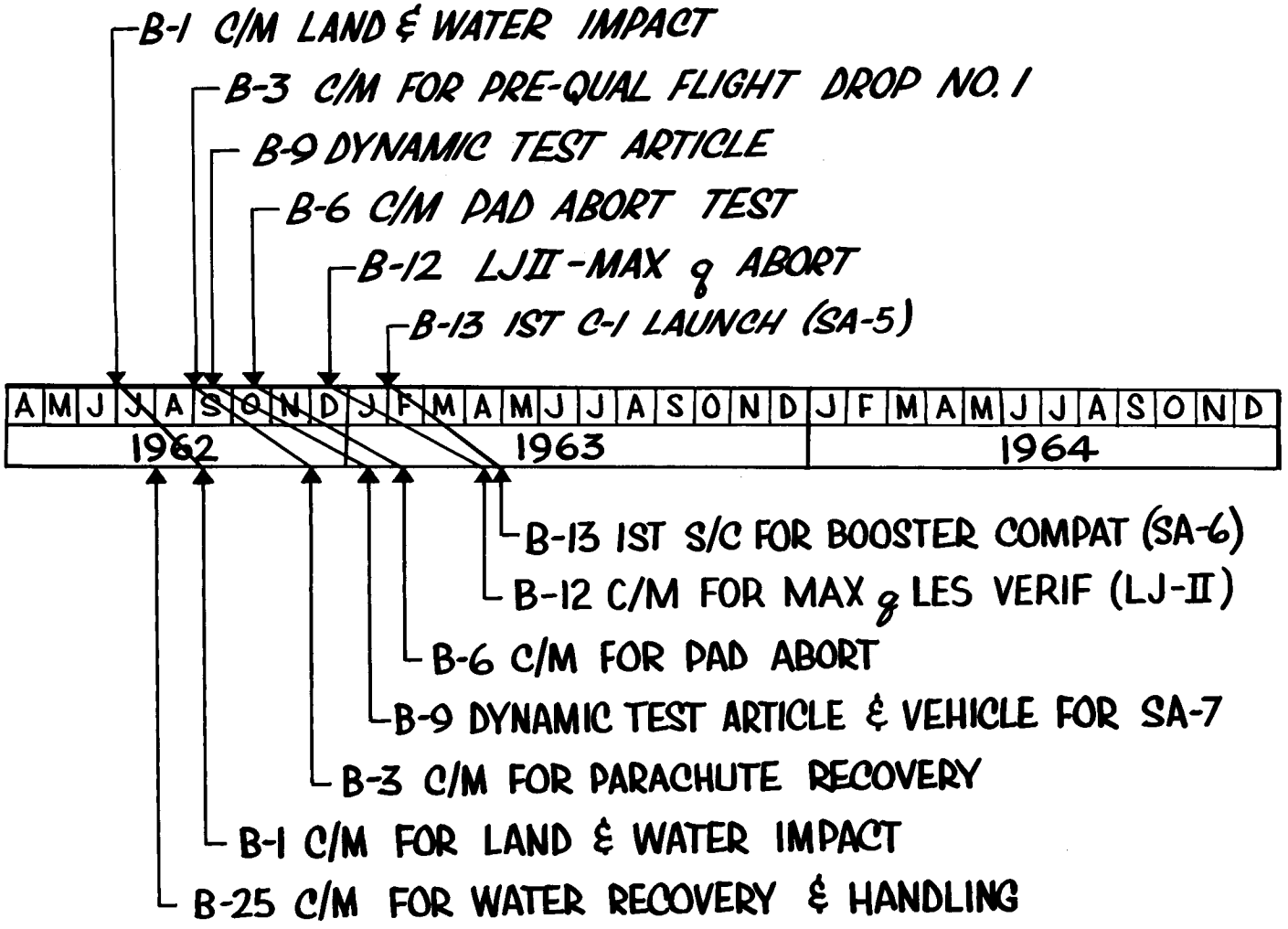

23 TRAINERS COMPLETE
MISSION SIMULATOR NO.2
MISSION SIMULATOR NO.1
MOON BASE TRAINER
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1963
1964
1965
MISSION SIMULATOR NO.2 (COMP)
MISSION SIMULATOR NO.1 (COMP)
NAVIGATION & TRAJECTORY CONT (PART TASK)
ORBITAL & RENDEZVOUS (PART TASK TRNR)
EARTH LAUNCH & REENTRY (PART TASK)

RED - 25 APRIL 1962 SCHEDULE
BLACK - 18 SEPT 1962 SCHEDULE

10-62 AP19877

MANUFACTURING COMPLETION DATES

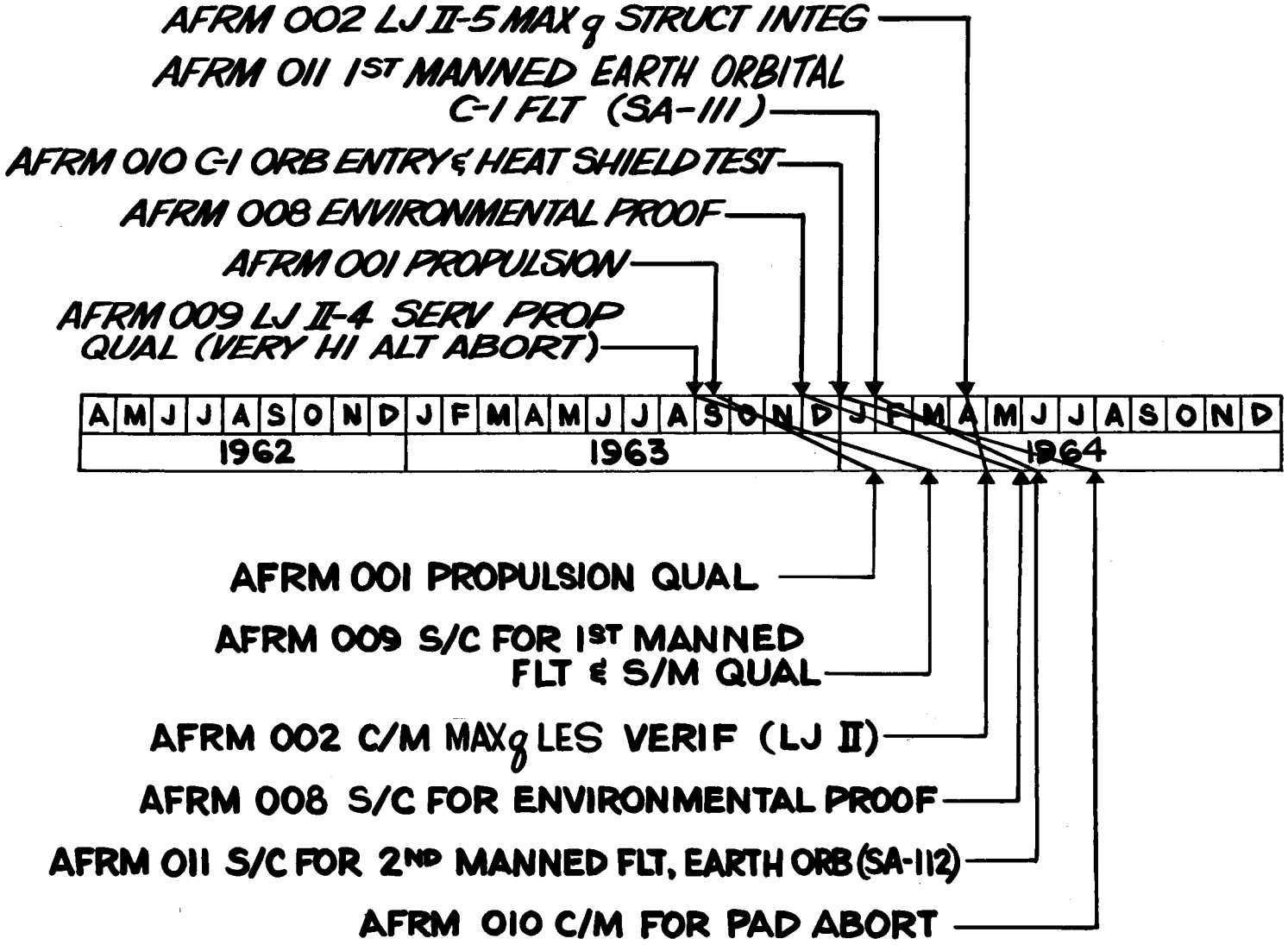
BOILERPLATES


B-1 C/M LAND & WATER IMPACT
B-3 C/M FOR PRE-QUAL FLIGHT DROP NO. 1
B-9 DYNAMIC TEST ARTICLE
B-6 C/M PAD ABORT TEST
B-12 LJII-MAX q ABORT
B-13 IST C-1 LAUNCH (SA-5)
A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1962
1963
1964
B-13 IST S/C FOR BOOSTER COMPAT (SA-6)
B-12 C/M FOR MAX q LES VERIF (LJ-II)
B-6 C/M FOR PAD ABORT
B-9 DYNAMIC TEST ARTICLE & VEHICLE FOR SA-7
B-3 C/M FOR PARACHUTE RECOVERY
B-1 C/M FOR LAND & WATER IMPACT
B-25 C/M FOR WATER RECOVERY & HANDLING

RED-27 APRIL 1962 SCHEDULE
BLACK-18 SEPT SCHEDULE

10-62 AP 22081A

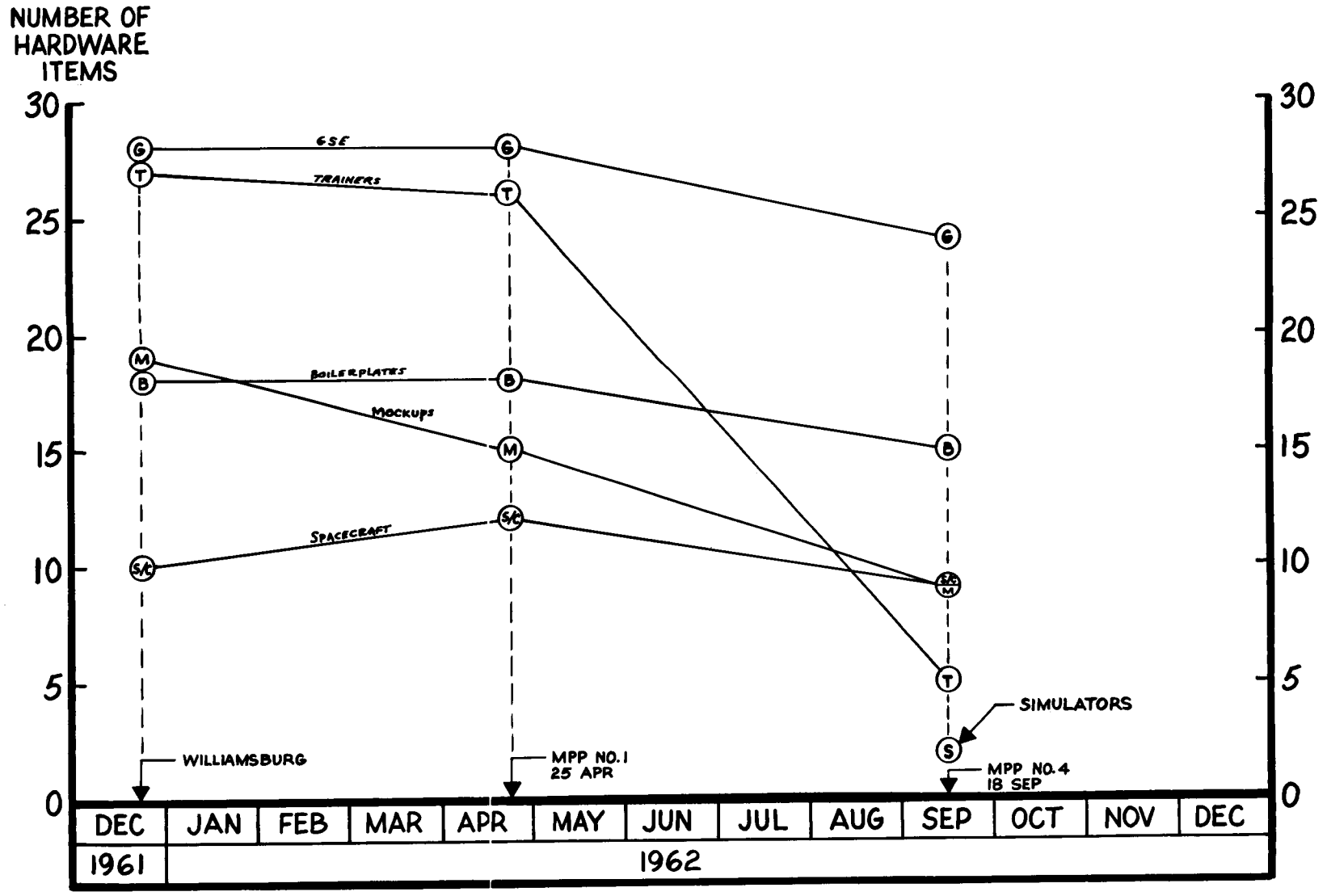
MANUFACTURING COMPLETION DATES
SPACECRAFT


AFRM 002 LJ II-5 MAX q STRUCT INTEG
AFRM 011 1ST MANNED EARTH ORBITAL C-1 FLT (SA-111)
AFRM 010 C-1 ORB ENTRY & HEAT SHIELD TEST
AFRM 008 ENVIRONMENTAL PROOF
AFRM 001 PROPULSION
AFRM 009 LJ II-4 SERV PROP QUAL (VERY HI ALT ABORT)
A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1962
1963
1964
AFRM 001 PROPULSION QUAL
AFRM 009 S/C FOR 1ST MANNED FLT & S/M QUAL
AFRM 002 C/M MAX q LES VERIF (LJ II)
AFRM 008 S/C FOR ENVIRONMENTAL PROOF
AFRM 011 S/C FOR 2ND MANNED FLT, EARTH ORB (SA-112)
AFRM 010 C/M FOR PAD ABORT

RED - 27 APRIL 1962 SCHEDULE
BLACK - 18 SEPT 1962 SCHEDULE

10-62 AP22082 A

NUMBER OF MAJOR HARDWARE ITEMS VS TIME



10-62 AP 22238

PERT ACCOMPLISHMENTS

• MSC/S&ID PERT TEAM REINSTATED	10 JULY 62
• MASTER NETWORK CONCEPT INTRODUCED	27 JULY 62
• TECHNICAL REVIEW OF G.O. NETWKS BEGUN	4 AUG 62
• MASTER NETWORK INTERIM REPORTING AGREEMENT	14 AUG 62
• REVISED MAJOR NETWORKS (24) SUBMITTED	20 AUG 62
• COMPLETE INITIAL MSC/S&ID MAJOR NETWORK TECHNICAL REVIEW	28 SEPT 62

10-62 19878

PERT FUTURE ACTIONS

- MAJOR NETWORK UPDATING 22 OCT 62
- FINAL JOINT REVIEW OF NETWORKS 29 OCT 62
- NAA DATA PROCESSING UPDATED NETWORKS 23 NOV 62
- FULL PERT REPORTING IMPLEMENTATION TARGET DATE 4 JAN 63

10-62 AP 19880

PMP POSITION

PAST EVENTS

- FIRST PMP REPORT SUBMITTED 5 JUL 62
- FIRST PMP TWX REPORT 12 JUL 62
- MILESTONE REVIEWS STARTED 12 SEP 62
- TWX REPORTING SUSPENDED BY MSC 12 SEP 62

PMP POSITION

FUTURE EVENTS

- SUBMIT INITIAL REVISED LIST OF DEVELOPMENTAL MILESTONES TO NASA — 8 OCT 62
- TRIAL RUN REPORT — 19 OCT 62
- BI-WEEKLY PMP REPORT — 26 OCT 62
- INITIAL INCORPORATION OF PMP INTO PERT REPORTING (TARGET DATE) — 28 DEC 62

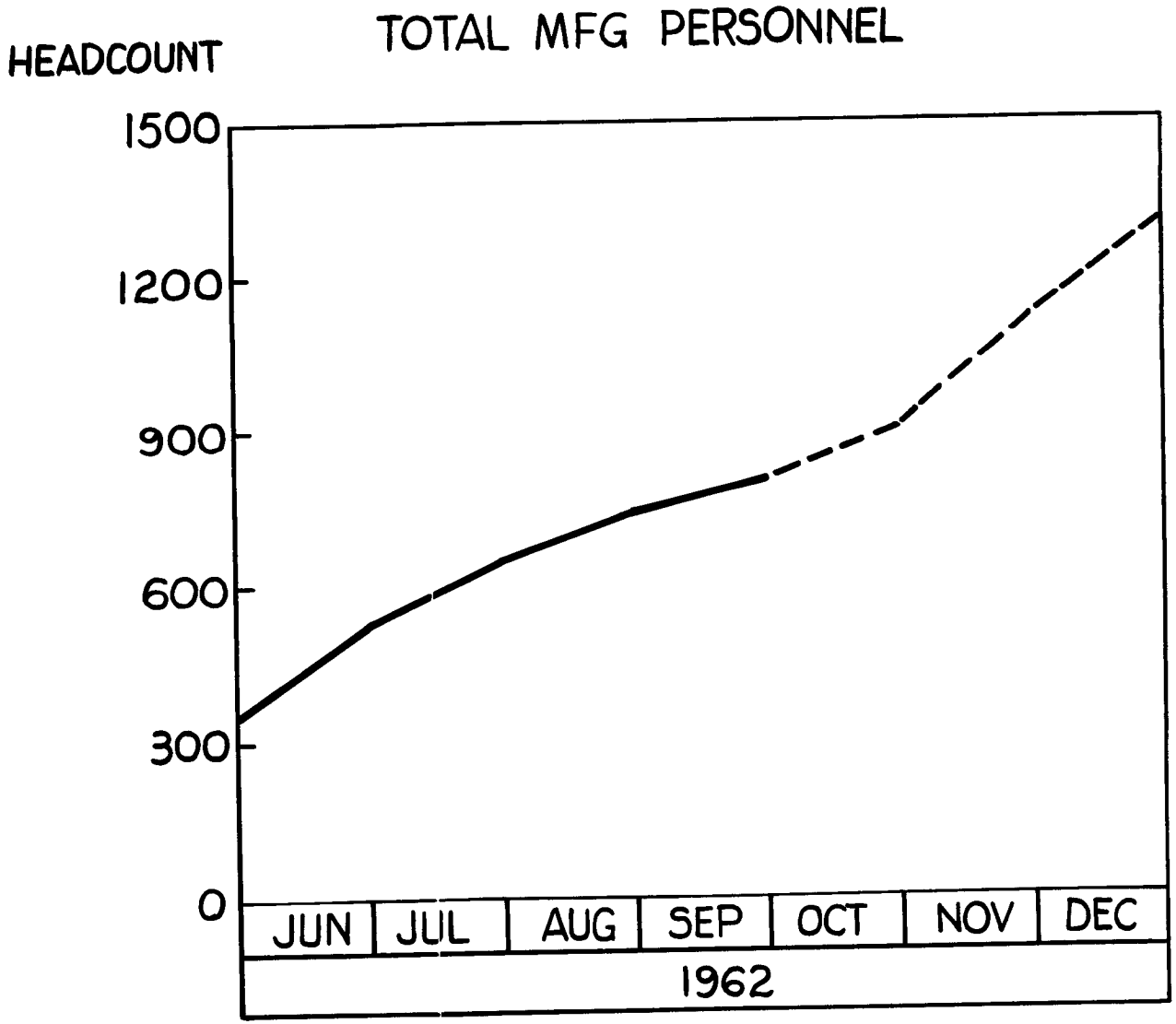
10-62 AP 19883

APOLLO MFG PROGRESS REPORT

THROUGH 30 SEP 1962

8-62 AP 18842

MANPOWER ACQUISITION



9-62 AP 18845A

PERSONNEL TRAINING

- INDOCTRINATION PROGRAM
- NASA CENTIFICATION SOLDERING
- NASA CENTIFICATION WELDING
- PERT INSTRUCTION
- SUPERVISION INTROCTRINATION

10-62 AP 18846 A

TOOLING SUMMARY

	BOILERPLATE	ATR	SPACECRAFT
TOOL DESIGNS			
DESIGNS IN WORK	54	47	28
DESIGNS COMPLETED	48	7	28
EST. TOTAL	450	54	2700
TOOLING FABRICATION			
DIMENSIONAL TOOLS			
IN WORK	117	22	51
COMPLETED	170	13	52
EST. TOTAL	800	87	4500

PLASTER MASTERS		
TOTAL IN WORK	1	
TOTAL COMPLETE	10	(LINES EXCLUDED)
EST. TOTAL	11	

9-62 AP 18849A

MANUFACTURING COMPLETION SUMMARY

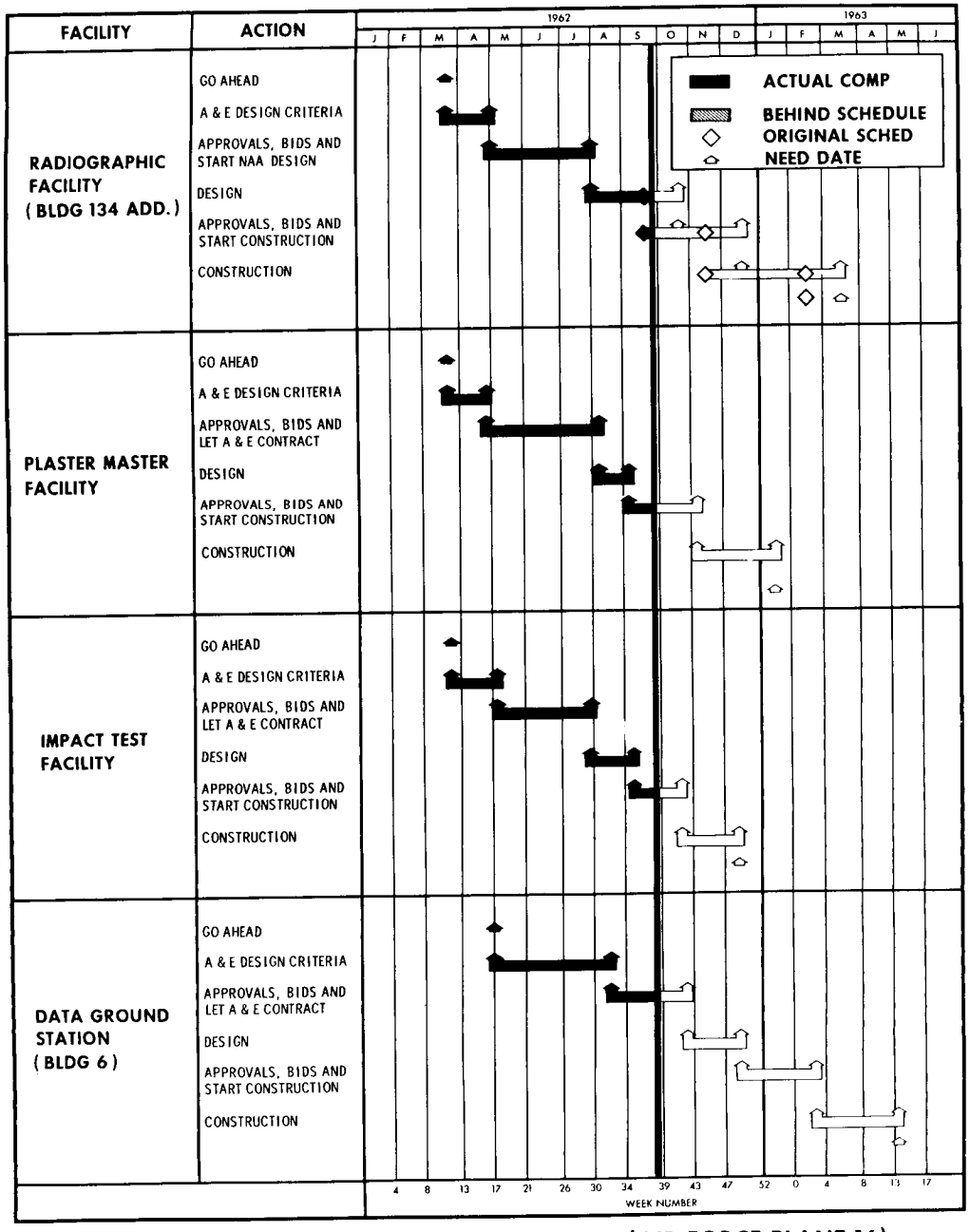
	ACTUAL 30 SEP	PROJECTED OCT-DEC
MOCKUPS & EVALUATORS	FIVE ARTICLES	SIX ARTICLES
BOILERPLATES	#25 & #1	# 3, 19, 2
ATR ARTICLES	1	5

9-62 AP 18853A

APOLLO FACILITIES THIRD QUARTERLY PROGRESS REPORT

AP 19893

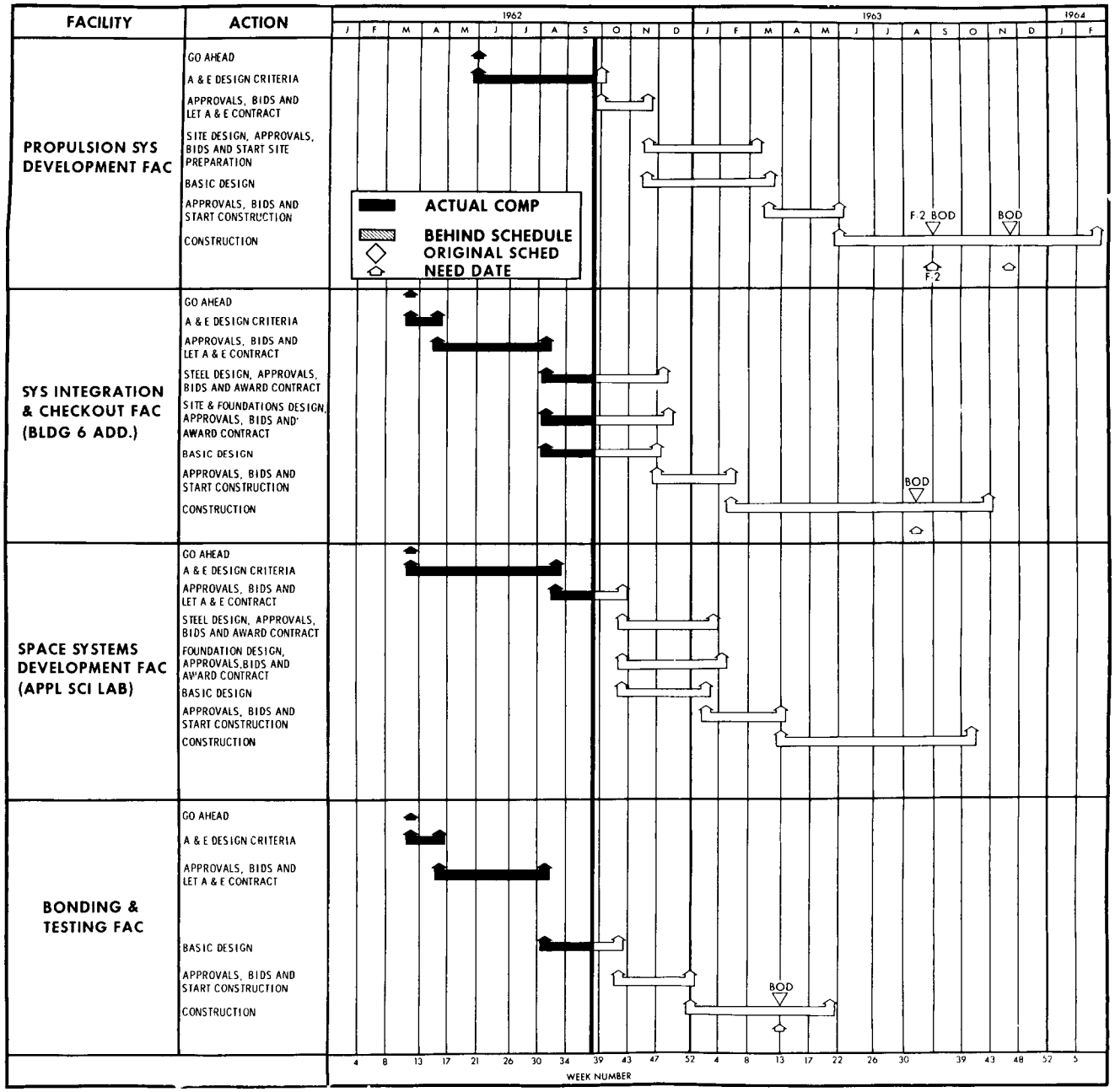
APOLLO FACILITIES STATUS



APOLLO FACILITIES PREPARATION SCHEDULE (AIR FORCE PLANT 16)

10-62 AP19894

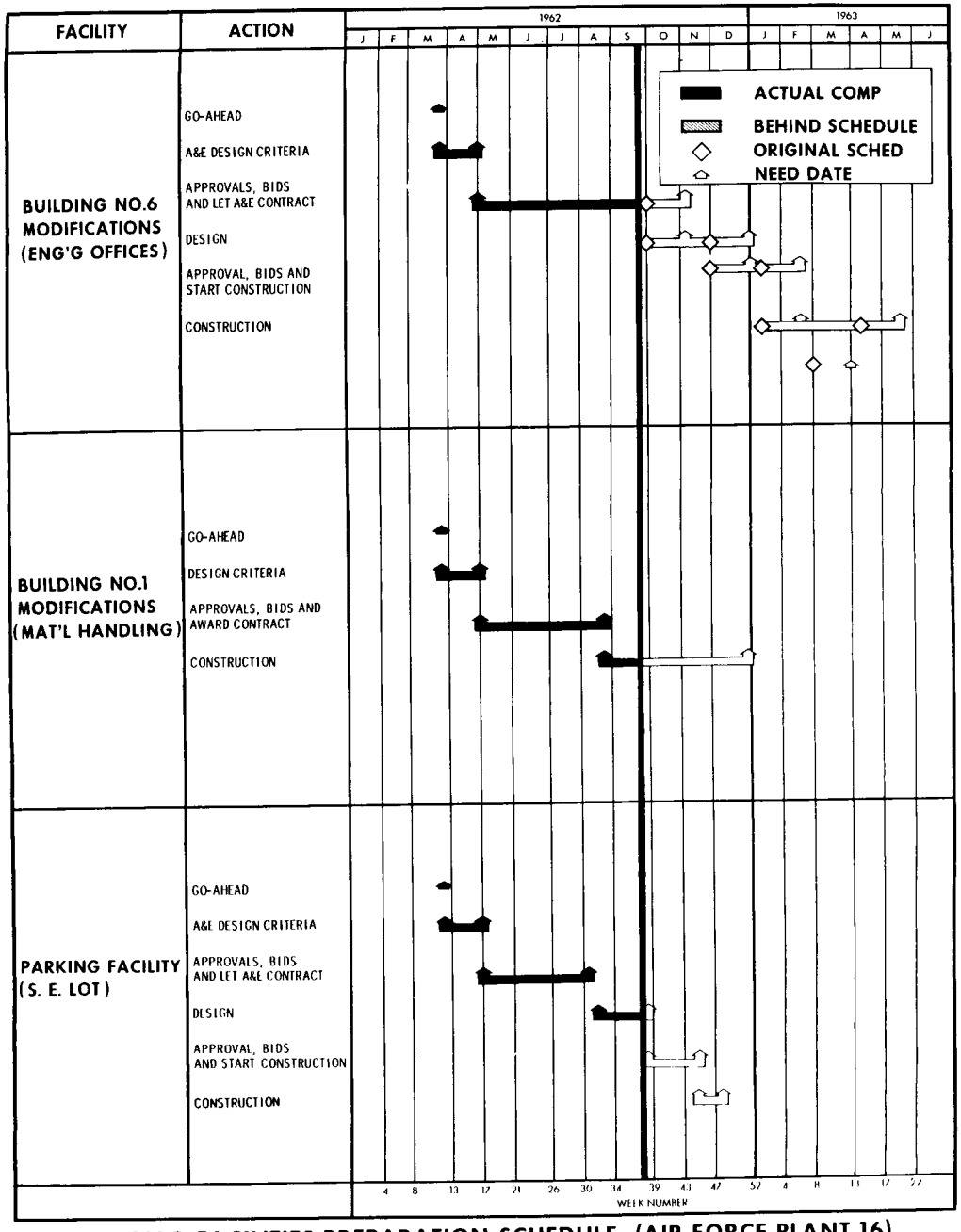
APOLLO FACILITIES STATUS


FACILITY
ACTION
1962
1963
1964
J F M A M J J A S O N D J F M A M J J A S O N D J F
PROPULSION SYS DEVELOPMENT FAC
GO AHEAD
A & E DESIGN CRITERIA
APPROVALS, BIDS AND LET A & E CONTRACT
SITE DESIGN, APPROVALS, BIDS AND START SITE PREPARATION
BASIC DESIGN
APPROVALS, BIDS AND START CONSTRUCTION
CONSTRUCTION
ACTUAL COMP
BEHIND SCHEDULE
ORIGINAL SCHED NEED DATE
F-2 BOD
BOD
F-2
SYS INTEGRATION & CHECKOUT FAC (BLDG 6 ADD.)
GO AHEAD
A & E DESIGN CRITERIA
APPROVALS, BIDS AND LET A & E CONTRACT
STEEL DESIGN, APPROVALS, BIDS AND AWARD CONTRACT
SITE & FOUNDATIONS DESIGN, APPROVALS, BIDS AND AWARD CONTRACT
BASIC DESIGN
APPROVALS, BIDS AND START CONSTRUCTION
CONSTRUCTION
BOD
SPACE SYSTEMS DEVELOPMENT FAC (APPL SCI LAB)
GO AHEAD
A & E DESIGN CRITERIA
APPROVALS, BIDS AND LET A & E CONTRACT
STEEL DESIGN, APPROVALS, BIDS AND AWARD CONTRACT
FOUNDATION DESIGN, APPROVALS, BIDS AND AWARD CONTRACT
BASIC DESIGN
APPROVALS, BIDS AND START CONSTRUCTION
CONSTRUCTION
BONDING & TESTING FAC
GO AHEAD
A & E DESIGN CRITERIA
APPROVALS, BIDS AND LET A & E CONTRACT
BASIC DESIGN
APPROVALS, BIDS AND START CONSTRUCTION
CONSTRUCTION
BOD
4 8 13 17 21 26 30 34 39 43 47 52 4 8 13 17 22 26 30 39 43 48 52 5
WEEK NUMBER

APOLLO FACILITIES PREPARATION SCHEDULE (AIR FORCE PLANT 16)

10-62 AP 19895

APOLLO FACILITIES STATUS



APOLLO FACILITIES PREPARATION SCHEDULE (AIR FORCE PLANT 16)

10-62 AP 19896

ACCOMPLISHMENTS - SUBCONTRACTORS

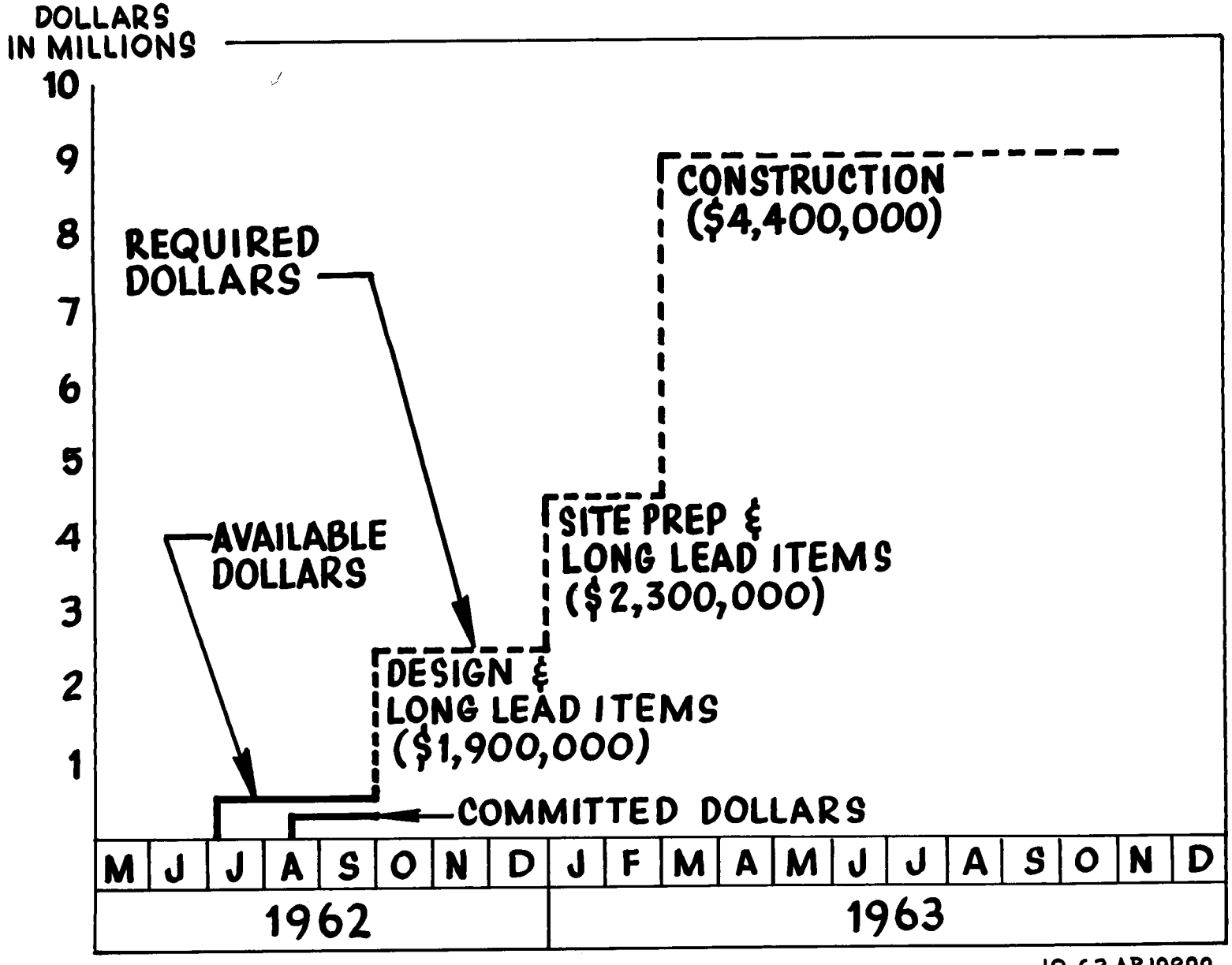
- AVCO
  APPENDIX "A" SUBMITTED
- MINNEAPOLIS-HONEYWELL
  APPENDIX "A" SUBMITTED
- NORTHROP - VENTURA
  OBTAINED USE AGREEMENT FOR EL CENTRO FACILITY
- PRATT - WHITNEY
  REVIEWED KNOWN REQUIREMENTS
- ALL OTHER SUBCONTRACTORS
  REVIEWED FACILITIES PLANS AND ASSISTED WITH REVIEW OF STE SUBMITTALS

ACCOMPLISHMENTS-OTHER

- TRAINER FAB AREA (COMPTON) CONST STARTED
- P.O. PLACED FOR STD & SPCL AUTOCLAVES & WELDERS
- ESCAPE TOWER FAB AREA WAS ACTIVATED
- FACILITIES PLAN COMPLETED

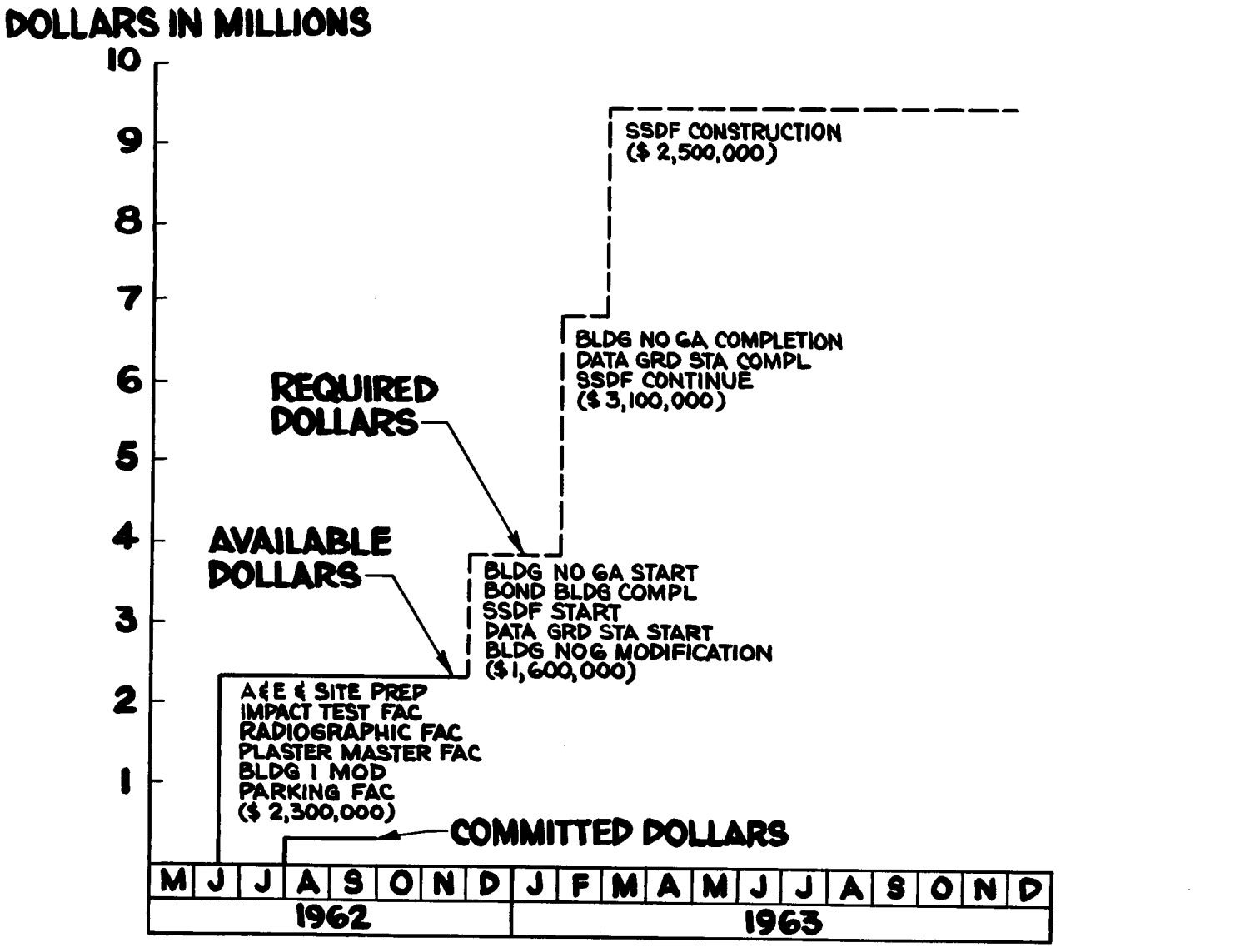
MAJOR FACILITIES FUNDS STATUS-CUMULATIVE

WHITE SANDS ONLY-(CONTRACT NO. 9-627)



10-62 AP 19899

MAJOR FACILITIES FUNDS STATUS-CUMULATIVE
DOWNEY ONLY (CONTRACT NO 7-90)



10-62 AP 19900

FUTURE ACTIVITIES
DOWNEY FACILITIES

- COMPLETE IMPACT TEST FACILITY
- START CONSTRUCTION OF PLASTER MASTER FACILITY
- START CONSTRUCTION OF RADIOGRAPHIC FACILITY
- COMPLETE DESIGN OF DATA GROUND STATION
- START CONSTRUCTION OF BOND & TEST FACILITY
- START DESIGN & ORDERS OF LONG LEAD ITEMS FOR SPACE SYSTEMS DEVELOPMENT FACILITY
- COMPLETE DESIGN OF SYSTEMS INTEGRATION AND CHECKOUT FACILITY

10-62 AP19901

FUTURE ACTIVITIES

WSMR

- SUBMIT APPENDIX "A"
- COMPLETE SITE SURVEYS
  - TOPOGRAPHIC
  - WATER SUPPLY
- COMPLETE SITE DESIGN
- START FACILITY DESIGN

FUTURE ACTIVITIES
SUBCONTRACTORS

- AVCO
  - ASSIST NASA WITH NEGOTIATIONS FOR FACILITY CONTRACT
- MINNEAPOLIS—HONEYWELL
  - ASSIST NASA WITH NEGOTIATIONS FOR FACILITY CONTRACT
- NORTHROP—VENTURA
  - ARRANGE FOR REHAB OF EL CENTRO FACILITY
- PRATT—WHITNEY
  - WILL SUBMIT KNOWN REQUIREMENTS
- COLLINS RADIO
  - WILL SUBMIT APPENDIX "A"

AP 19903

APOLLO
MATERIAL DEPARTMENT
QUARTERLY PROGRESS REPORT
SEPT 1962

10-62 AP 19852

MANUFACTURING COMPLETION SUMMARY

	ACTUAL 30 SEP	PROJECTED OCT-DEC
MOCKUPS & EVALUATORS	FIVE ARTICLES	SIX ARTICLES
BOILERPLATES	#25 & #1	# 3, 19, 2
ATR ARTICLES	1	5

9-62 AP 18853A

PREVIOUS COMMITMENTS FOR THIRD QUARTER & PERFORMANCE

COMMITMENTS	ACTION
• DEFINITIVE CONTRACTS BY 30 AUG 62	NOT ACCOMPLISHED
• RESIDENT REPS BY 30 JUL 62	ACCOMPLISHED
• COST MANAGEMENT	INITIATED
• COST REDUCTION PROGRAMS	INITIATED
• SUBCONTRACTOR BRIEFINGS	ACCOMPLISHED – CONTINUES
• CONTINUED FACILITY SURVEYS	CONTINUING

INTERNAL

- CENTRALIZED TOTAL FUNDING FOR MATERIAL ESTABLISHED IN APOLLO PROGRAM
- SPECIAL WORKSHOP SESSION FOR RESIDENT REPS
- STANDARDIZED MGMT REPORTING CHARTS FOR RESIDENT REPS
- WEEKLY BRIEFING ON COST & SCHEDULE STATUS
- REORGANIZATION & CONSOLIDATION OF DEPT
- PHASE I - TRAINING PROGRAM COMPLETED (8 WEEKS)
- ESTABLISHED MATERIAL DEPT CONFIGURATION, SCHEDULE & CHANGE CONTROL GROUP
- ASSUMED MGMT OF ALL OUTGOING APOLLO IDWA'S
- INSTITUTED COST REDUCTION PROGRAM WITHIN DEPARTMENT

DOLLARS COMMITTED

SUBCONTRACTOR	NAA CURRENT FUNDING	SUBCONTRACTOR EXPENDITURES PLUS COMMITMENTS (CUMUL)		
		OCT	NOV	DEC
COLLINS RADIO	10.500	8.370	16.046	19.155 (27)
LOCKHEED	2.250	2.162	2.341	2.799
MINN-HONEYWELL	11.625	11.702	14.618	18.282
PRATT/WHITNEY	8.100	8.851	10.685	12.943
NORTHROP-VENTURA	1.900	1.850	2.001	2.351
AIRESEARCH	4.383	4.664	5.415	6.202
AVCO	4.880	4.314	5.071	5.756
AEROJET	3.200	4.838	6.450	8.063
MARQUARDT	4.533	4.056	4.788	5.556
THIOKOL	1.030	.996	1.050	1.157
BEECH AIRCRAFT	.700	.344	1.051	1.784
MELPAR	.064	.051	.072	.094
TOTALS	53.165	52.198	69.588	84.142

NOTE: 2.256 COMMITTED BY CENTRAL PURCHASING

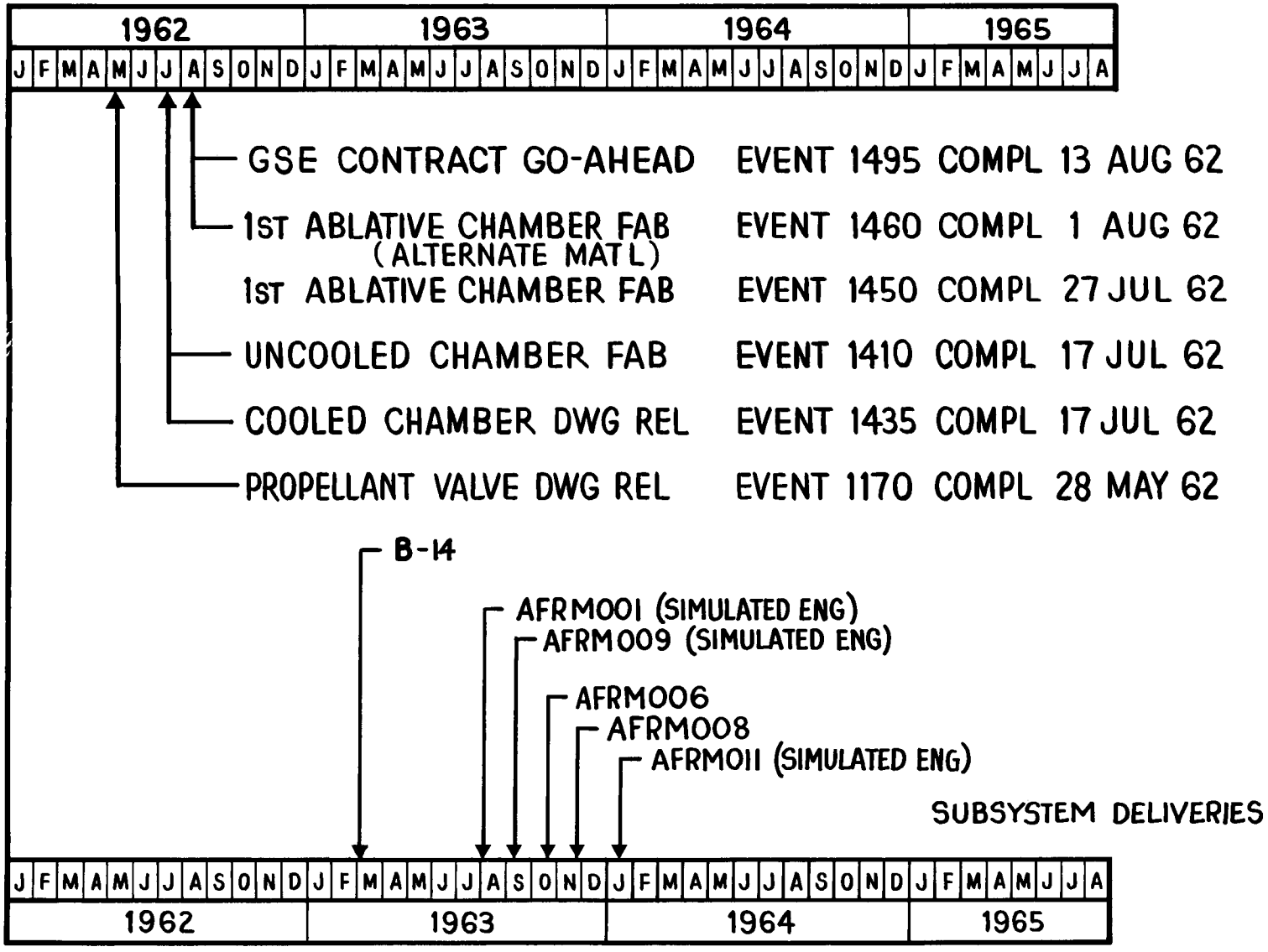
10-62 AP 19859

ITEMS TO BE PLACED

ITEM	EST CONT DATE	ITEM	EST CONT DATE
CENTRAL TIMING SYSTEM	19 NOV	RECOVERY ANTENNA SYSTEM	12 OCT
PROPELLANT UTIL SYSTEM	19 OCT	HIGH-GAIN ANTENNA SYSTEM	19 NOV
STATIC INVERTER	16 OCT	RADOME	30 NOV
BATTERY CHARGER	15 OCT	BEACON ANTENNA SYSTEM	15 NOV
BATTERIES	1 OCT	POS EXPULSION TANKS	14 DEC
OXIDIZER & HELIUM TANKS	12 DEC	IN-FLIGHT TEST SYSTEM	2 JAN 63

SERVICE PROPULSION ENGINE - AEROJET

SYSTEMS COMPLETION SCHEDULE

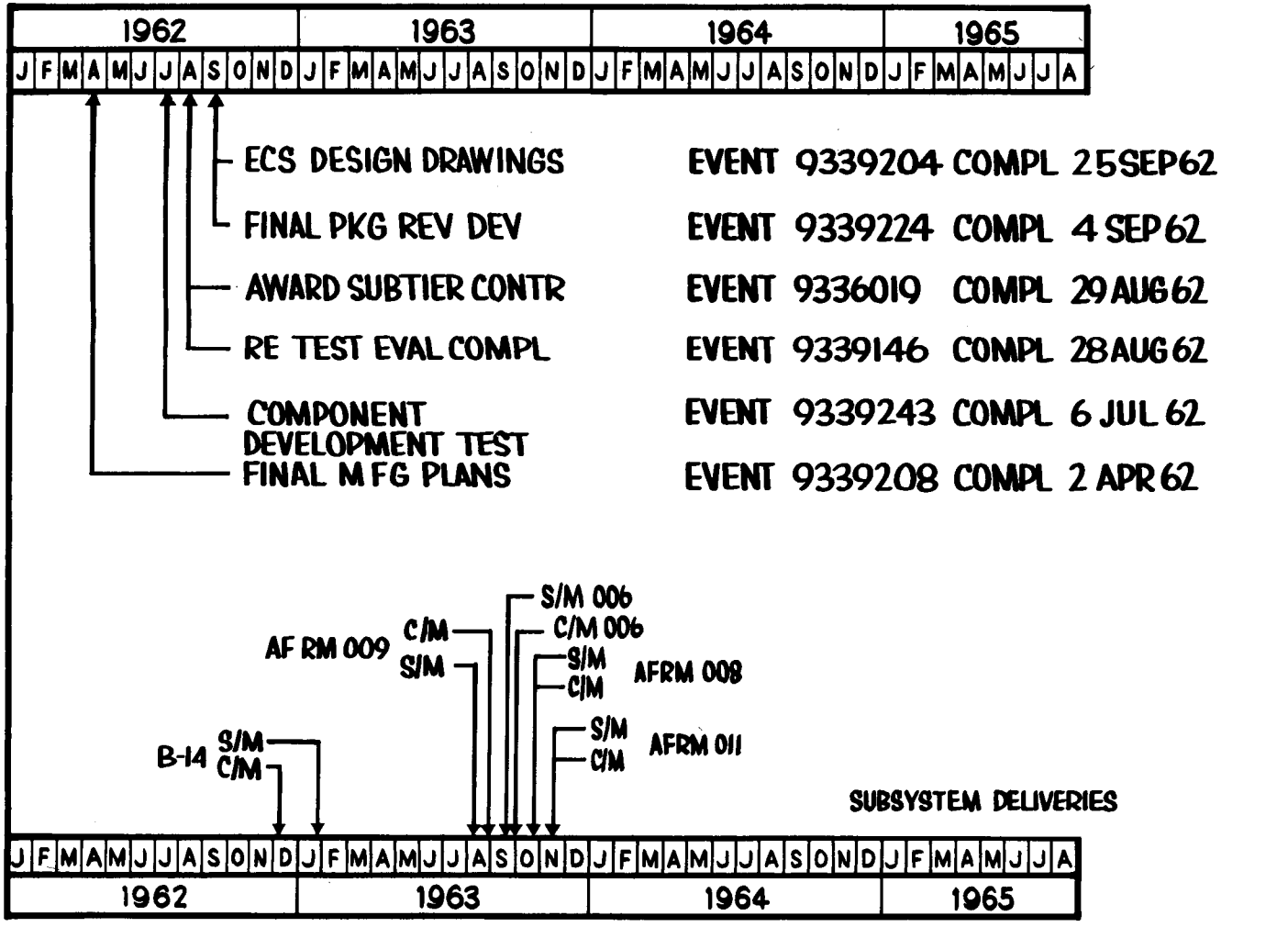

1962
1963
1964
1965
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
GSE CONTRACT GO-AHEAD EVENT 1495 COMPL 13 AUG 62
1ST ABLATIVE CHAMBER FAB (ALTERNATE MATL) EVENT 1460 COMPL 1 AUG 62
1ST ABLATIVE CHAMBER FAB EVENT 1450 COMPL 27 JUL 62
UNCOOLED CHAMBER FAB EVENT 1410 COMPL 17 JUL 62
COOLED CHAMBER DWG REL EVENT 1435 COMPL 17 JUL 62
PROPELLANT VALVE DWG REL EVENT 1170 COMPL 28 MAY 62
B-14
AFRM001 (SIMULATED ENG)
AFRM009 (SIMULATED ENG)
AFRM006
AFRM008
AFRM011 (SIMULATED ENG)
SUBSYSTEM DELIVERIES
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
1962
1963
1964
1965

APOLLO MASTER PHASING SCHEDULE

10-62 AP 19861A

ENVIRONMENTAL CONTROL SYSTEM - AIRESEARCH

SYSTEMS COMPLETION SCHEDULE

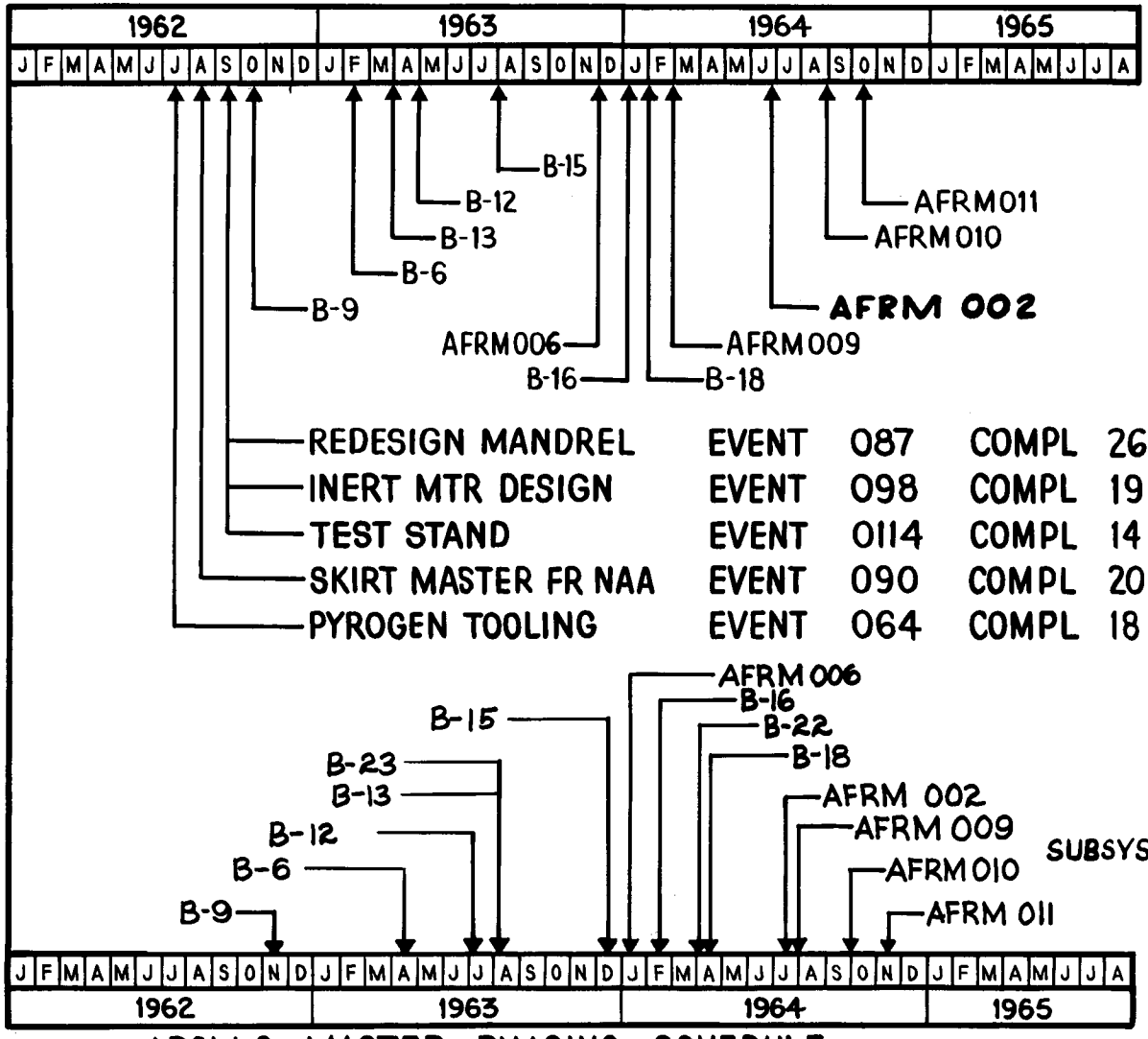

1962
1963
1964
1965
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
ECS DESIGN DRAWINGS
EVENT 9339204 COMPL 25SEP62
FINAL PKG REV DEV
EVENT 9339224 COMPL 4 SEP 62
AWARD SUBTIER CONTR
EVENT 9336019 COMPL 29 AUG 62
RE TEST EVAL COMPL
EVENT 9339146 COMPL 28 AUG 62
COMPONENT DEVELOPMENT TEST
EVENT 9339243 COMPL 6 JUL 62
FINAL MFG PLANS
EVENT 9339208 COMPL 2 APR 62
S/M 006
C/M 006
AF RM 009
C/M
S/M
S/M
C/M
AFRM 008
S/M
C/M
AFRM 011
B-14
S/M
C/M
SUBSYSTEM DELIVERIES
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
1962
1963
1964
1965

APOLLO MASTER PHASING SCHEDULE

10-62 AP19862A

LAUNCH ESCAPE MOTOR - LOCKHEED

SYSTEMS COMPLETION SCHEDULE

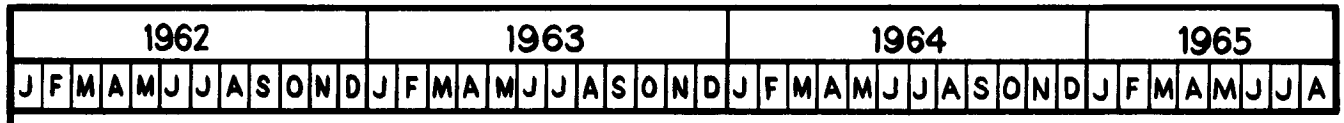

1962
1963
1964
1965
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
B-15
B-12
B-13
B-6
B-9
AFRM006
B-16
B-18
AFRM009
AFRM 002
AFRM010
AFRM011
REDESIGN MANDREL EVENT 087 COMPL 26 SEP 62
INERT MTR DESIGN EVENT 098 COMPL 19 SEP 62
TEST STAND EVENT 0114 COMPL 14 SEP 62
SKIRT MASTER FR NAA EVENT 090 COMPL 20 AUG 62
PYROGEN TOOLING EVENT 064 COMPL 18 JUL 62
AFRM 006
B-16
B-22
B-18
AFRM 002
AFRM 009
AFRM010
AFRM 011
B-15
B-23
B-13
B-12
B-6
B-9
SUBSYSTEM DELIVERIES
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
1962
1963
1964
1965

APOLLO MASTER PHASING SCHEDULE

10-62 AP 19863A

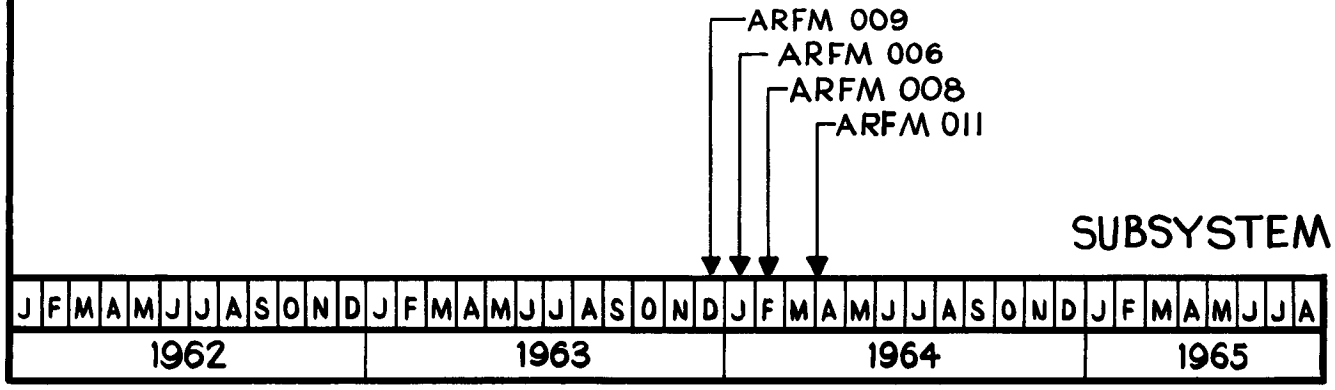
HEAT SHIELD - AVCO

SYSTEMS COMPLETIONS SCHEDULE



NOTE: DEFINITION OF SUBSTRUCTURE INTERFACE
26 OCT 62

RECOMMENDED MATERIAL DESIGN & FAB
15 NOV 62

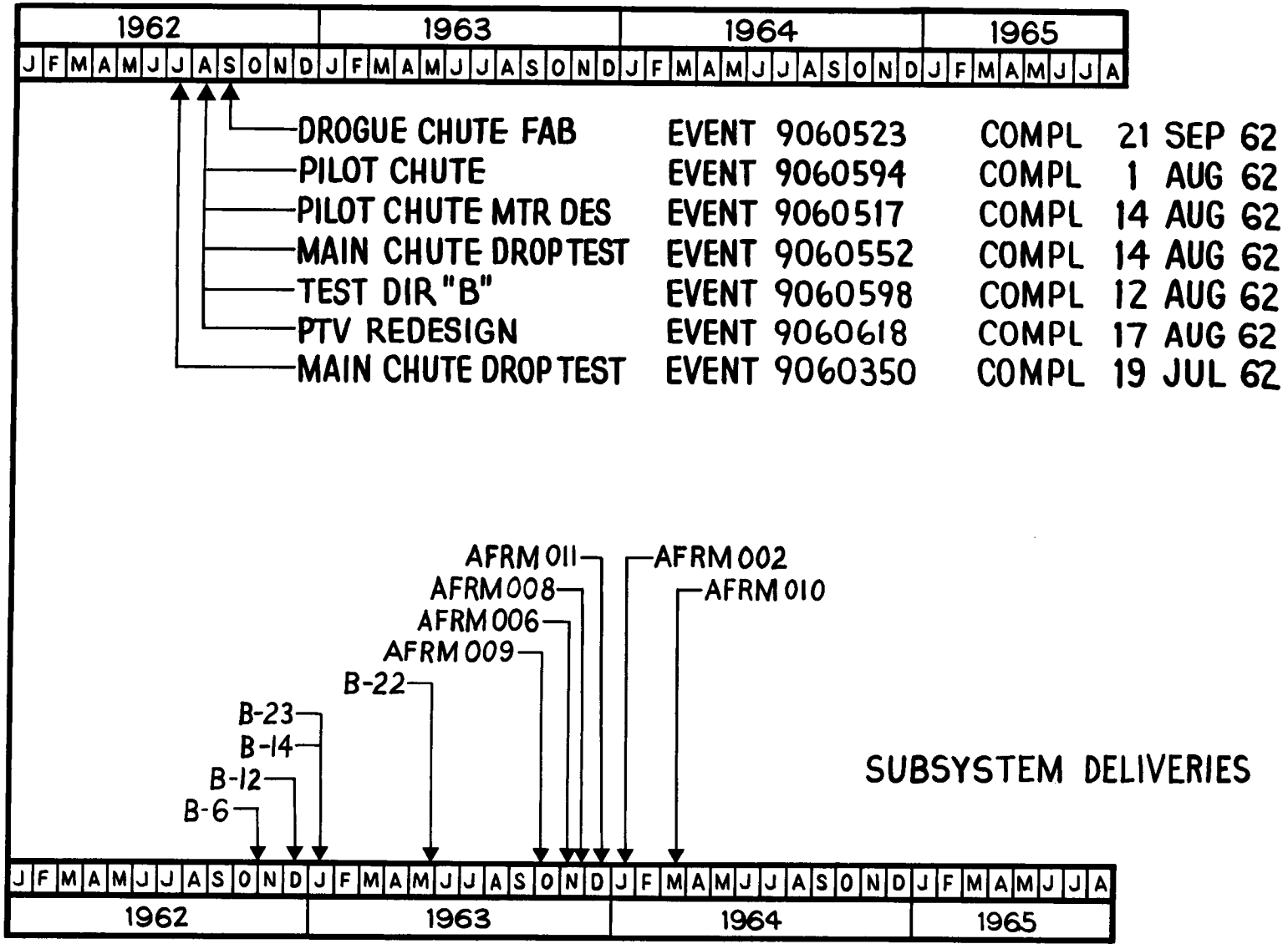

ARFM 009
ARFM 006
ARFM 008
ARFM 011
SUBSYSTEM DELIVERIES
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
1962
1963
1964
1965

APOLLO MASTER PHASING SCHEDULE

10-62 AP 19864A

EARTH LANDING SYSTEM - NORTHROP-VENTURA

SYSTEMS COMPLETION SCHEDULE

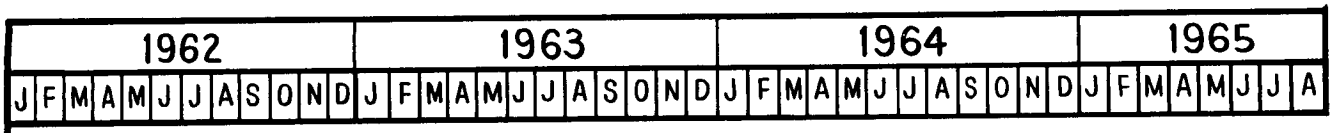

1962
1963
1964
1965
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
DROGUE CHUTE FAB EVENT 9060523 COMPL 21 SEP 62
PILOT CHUTE EVENT 9060594 COMPL 1 AUG 62
PILOT CHUTE MTR DES EVENT 9060517 COMPL 14 AUG 62
MAIN CHUTE DROP TEST EVENT 9060552 COMPL 14 AUG 62
TEST DIR "B" EVENT 9060598 COMPL 12 AUG 62
PTV REDESIGN EVENT 9060618 COMPL 17 AUG 62
MAIN CHUTE DROP TEST EVENT 9060350 COMPL 19 JUL 62
AFRM 011
AFRM 008
AFRM 006
AFRM 009
B-22
B-23
B-14
B-12
B-6
AFRM 002
AFRM 010
SUBSYSTEM DELIVERIES
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
1962
1963
1964
1965

APOLLO MASTER PHASING SCHEDULE

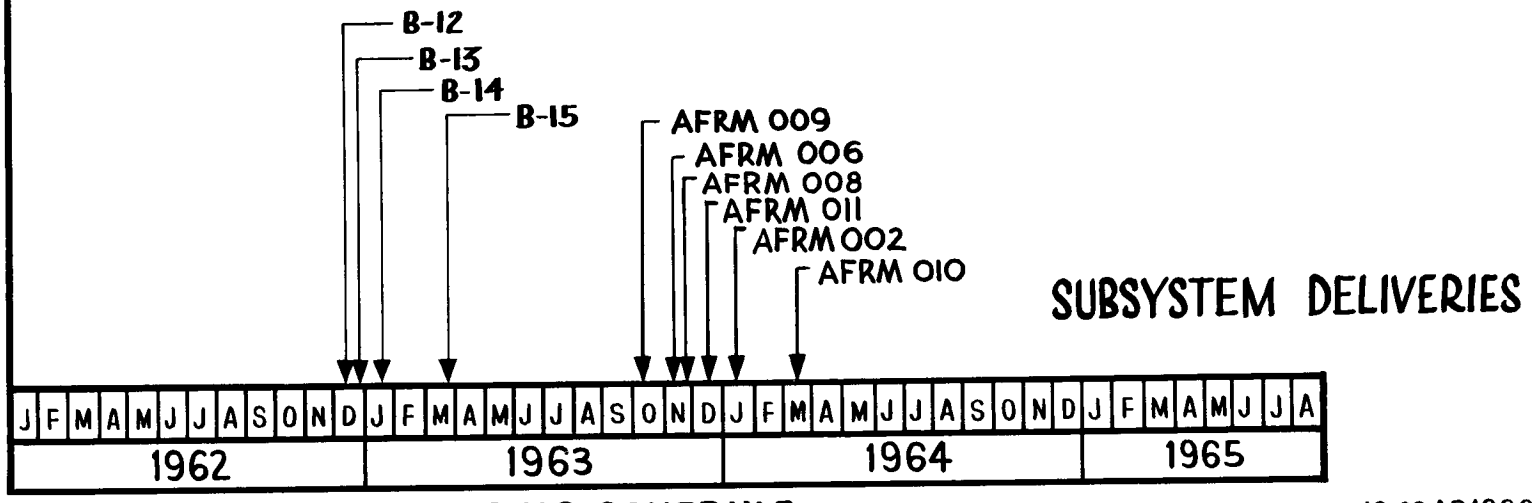
10-62 AP19865A

TELECOMMUNICATIONS - COLLINS

SYSTEMS COMPLETION SCHEDULE



NOTE: SUBCONTRACTOR ON SCHEDULE IN BASIC DESIGN

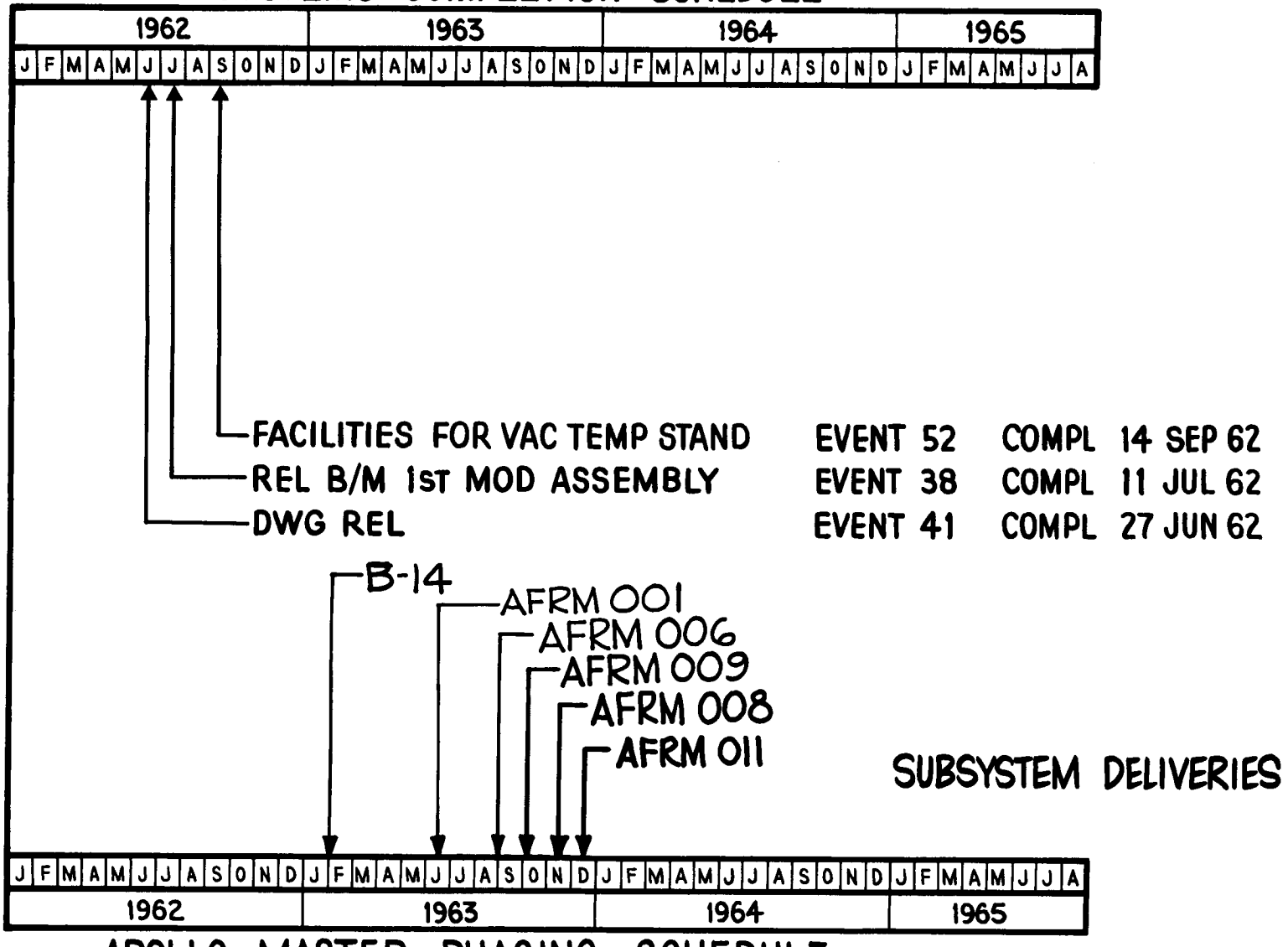

B-12
B-13
B-14
B-15
AFRM 009
AFRM 006
AFRM 008
AFRM 011
AFRM 002
AFRM 010
SUBSYSTEM DELIVERIES
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
1962
1963
1964
1965

APOLLO MASTER PHASING SCHEDULE

10-62 AP 19866A

FUEL CELLS PRATT & WHITNEY

SYSTEMS COMPLETION SCHEDULE

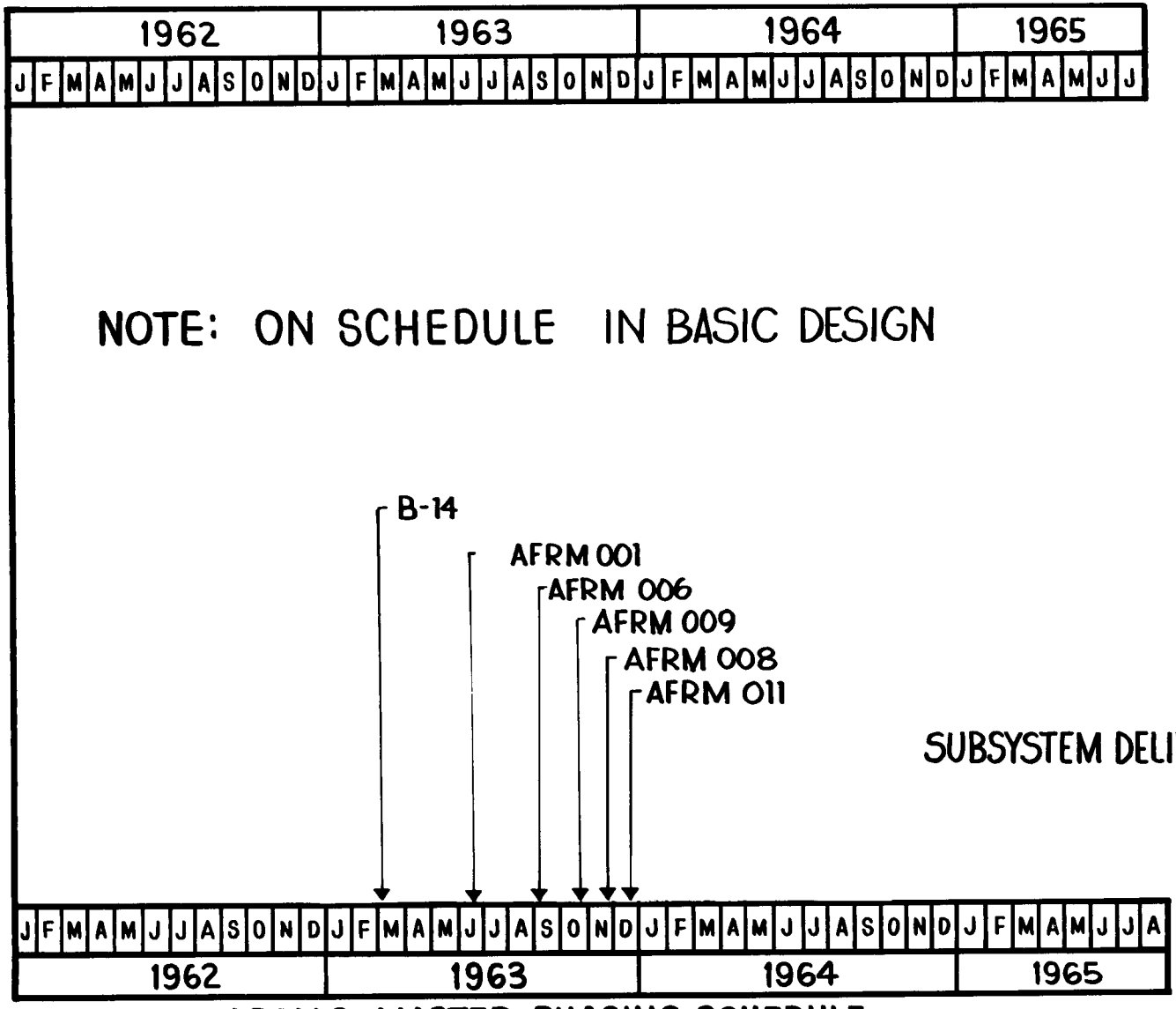

1962
1963
1964
1965
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
FACILITIES FOR VAC TEMP STAND
REL B/M 1ST MOD ASSEMBLY
DWG REL
EVENT 52 COMPL 14 SEP 62
EVENT 38 COMPL 11 JUL 62
EVENT 41 COMPL 27 JUN 62
B-14
AFRM 001
AFRM 006
AFRM 009
AFRM 008
AFRM 011
SUBSYSTEM DELIVERIES
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
1962
1963
1964
1965

APOLLO MASTER PHASING SCHEDULE

10-62 AP 19867A

EACTION CONTROL ENGINE - MARQUARDT

SYSTEMS COMPLETION SCHEDULE

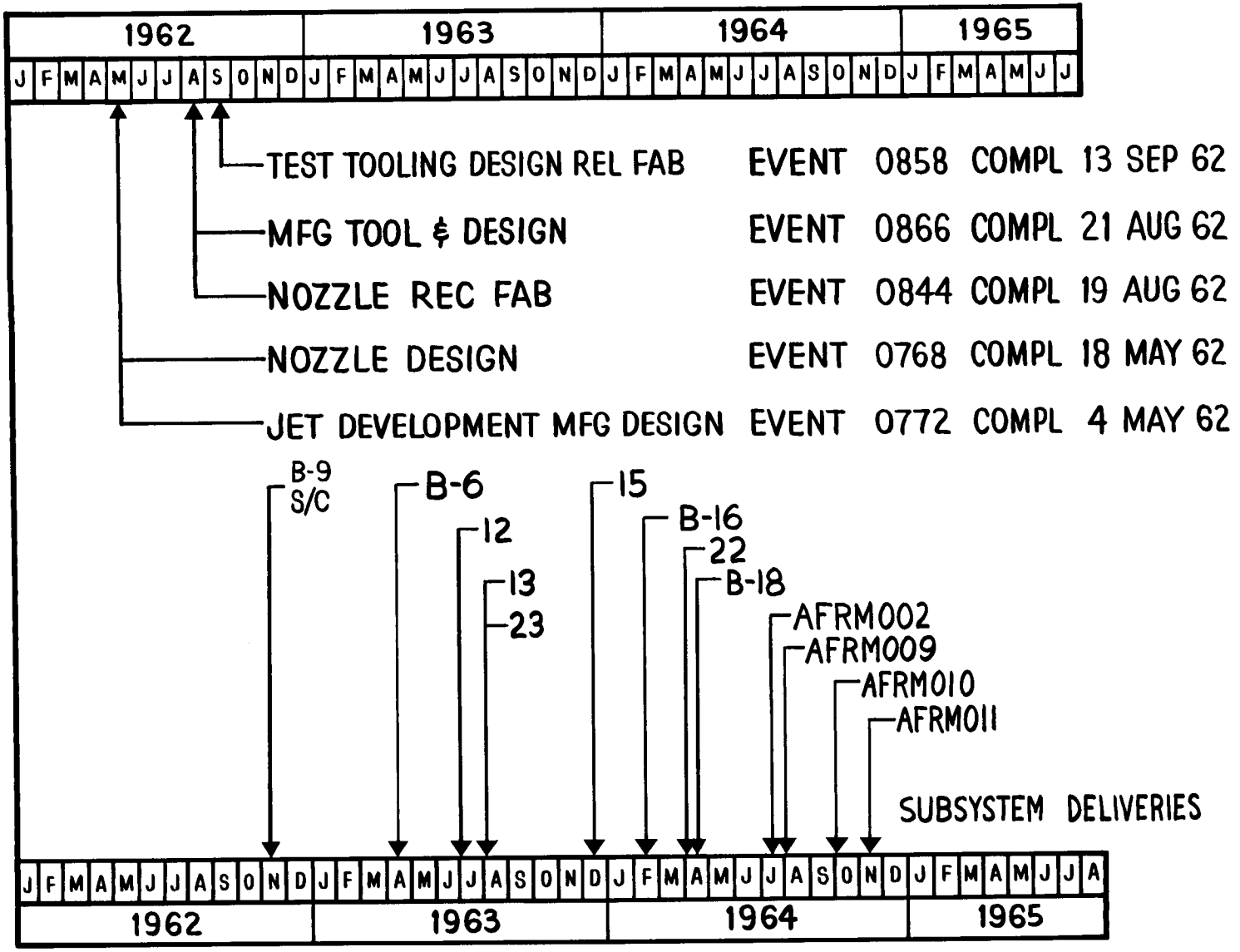

1962
1963
1964
1965
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J
NOTE: ON SCHEDULE IN BASIC DESIGN
B-14
AFRM 001
AFRM 006
AFRM 009
AFRM 008
AFRM 011
SUBSYSTEM DELIVERIES
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
1962
1963
1964
1965

APOLLO MASTER PHASING SCHEDULE

10-62 AP19868A

TOWER JETTISON MOTOR - THIOKOL

SYSTEMS COMPLETION SCHEDULE

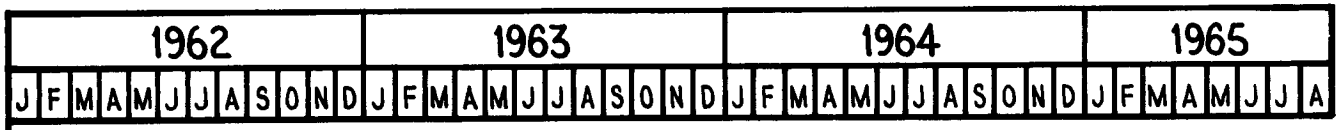

1962
1963
1964
1965
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J
TEST TOOLING DESIGN REL FAB EVENT 0858 COMPL 13 SEP 62
MFG TOOL & DESIGN EVENT 0866 COMPL 21 AUG 62
NOZZLE REC FAB EVENT 0844 COMPL 19 AUG 62
NOZZLE DESIGN EVENT 0768 COMPL 18 MAY 62
JET DEVELOPMENT MFG DESIGN EVENT 0772 COMPL 4 MAY 62
B-9 S/C
B-6
12
13
23
15
B-16
22
B-18
AFRM002
AFRM009
AFRM010
AFRM011
SUBSYSTEM DELIVERIES
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
1962
1963
1964
1965

APOLLO MASTER PHASING SCHEDULE

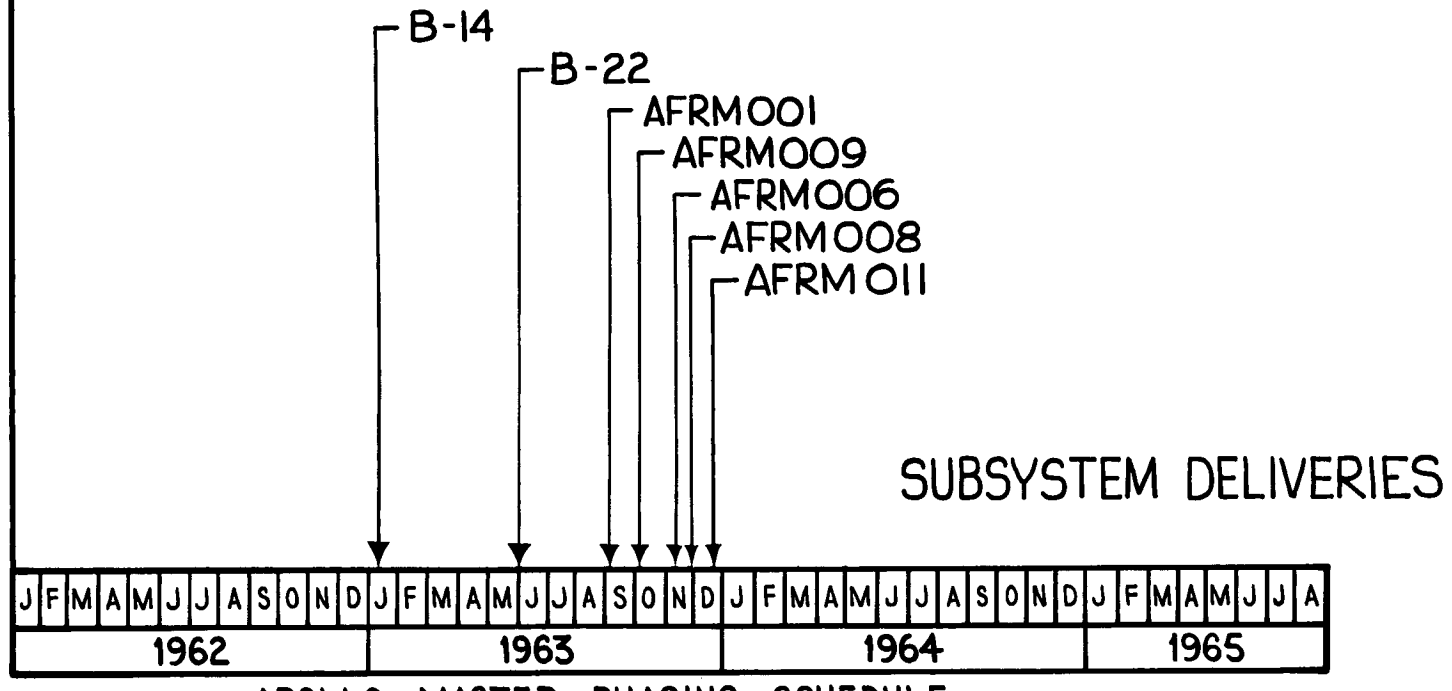
10-62 AP19869A

STABILIZATION & CONTROL – MINNEAPOLIS-HONEYWELL

SYSTEMS COMPLETION SCHEDULE



NOTE: SUBCONTRACTOR ON SCHEDULE IN BASIC DESIGN


B-14
B-22
AFRM001
AFRM009
AFRM006
AFRM008
AFRM011
SUBSYSTEM DELIVERIES
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
1962
1963
1964
1965

APOLLO MASTER PHASING SCHEDULE

10-62 AP 19870A

ITEMS TO BE ACCOMPLISHED

- DEFINITIZE REVISED HARDWARE LIST WITH SUBCONTRACTORS
- CONDUCT RENEWED FIELD ANALYSES
- CONDUCT DEFINITIVE NEGOTIATIONS WITH SUBCONTRACTORS
- PLACE ADDITIONAL SUBCONTRACTS
- FINALIZE SPECIAL TESTING EQUIPMENT & FACILITY REQUIREMENTS
- PHASE II - TRAINING PROGRAM
    1. COST CONTROL & ESTIMATING PROFICIENCY
    2. SESSION ON REFINED NEGOTIATION TECHNIQUES
    3. PERT TECHNIQUES

QUALITY CONTROL - APOLLO

QUALITY ACTIVITIES

- PRODUCTION ORDERS REVIEWED 9297
- INSPECTION INSTRUCTION SHEETS 90
- FABRICATION ASSEMBLY INSP RECORD (FAIR) IMPLEMENTED IN MANUFACTURING
- PURCHASE ORDERS REVIEWED 1998
- QC PARTICIPATION IN DESIGN REVIEW
- SPECIFICATIONS & PROCEDURES APP'V'D 49

QUALITY CONTROL - APOLLO

SUPPLIER SURVEYS & QC REPS

- SUPPLIERS SURVEYED - - - - - - - 21

  APPROVED - - - - - - - 12

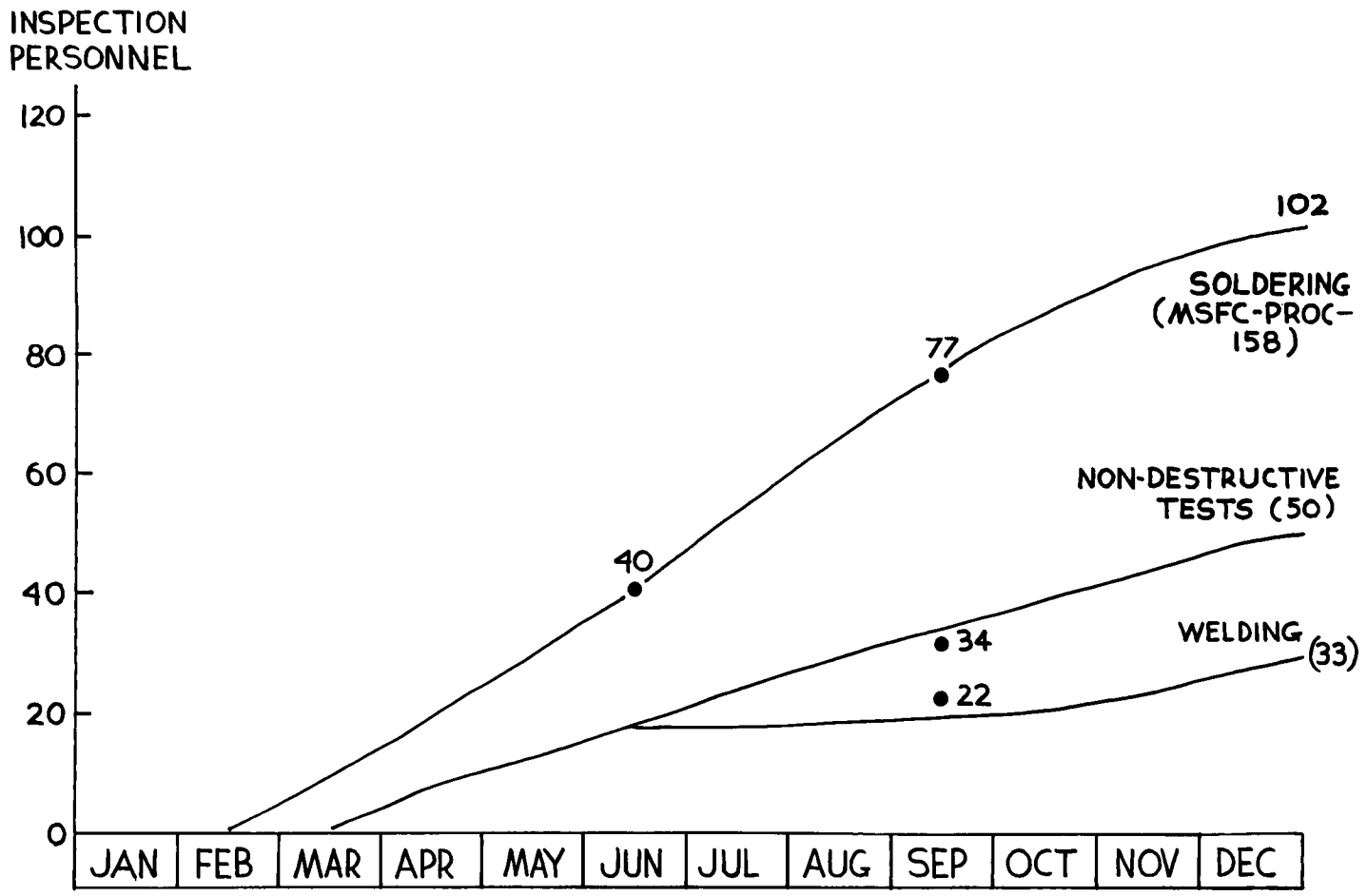
  DISAPPROVED - - - - - - 9

- QC REPRESENTATIVES STATIONED AT SUPPLIERS - - - - - - - - 7

  (ALL SUBCONTRACTORS EXCEPT AVCO COVERED)

QUALITY CONTROL-APOLLO

SKILL CERTIFICATION REQUIREMENTS



10-62 AP 19724

QUALITY CONTROL-APOLLO

DOCUMENTATION

- QC DOCUMENTATION TO NASA
  - 29 PROCESS CONTROL PROCEDURES
  - VOL II S&ID QC PLAN
  - INDEX OF ALL SUBCONTRACTOR DOCUMENTS
  - S&ID COMMENTS TO SUBCONTRACTOR DOCUMENTS
  - MAINTENANCE & CALIBRATION MANUALS VOL 1&2

- REVIEW OF SUBCONTRACTOR DOCUMENTATION
  - 4 QC PLANS REVIEWED
  - 6 END ITEM TEST PLANS
  - 91 TYPE II PROGRESS & STATUS REPORTS

- SUBCONTRACTOR QC PLANS
  - APPROVED - AEROJET & AVCO
  - PREVIOUSLY APPROVED - M-H, COLLINS, AIRESEARCH
  - IN COORDINATION - REMAINING 6 SUBS

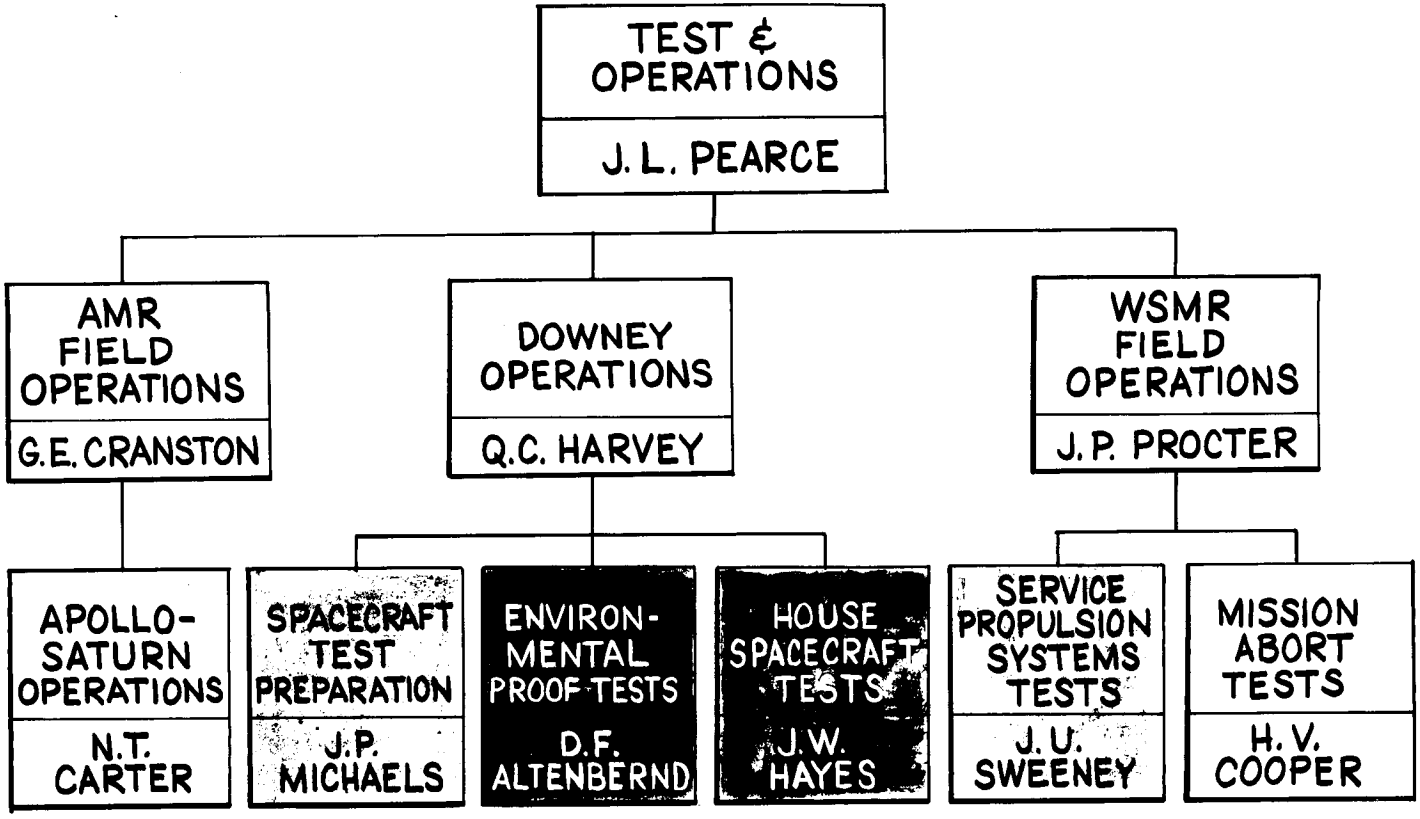
APOLLO TEST AND OPERATIONS

10-62 AP 19984

MISSIONS

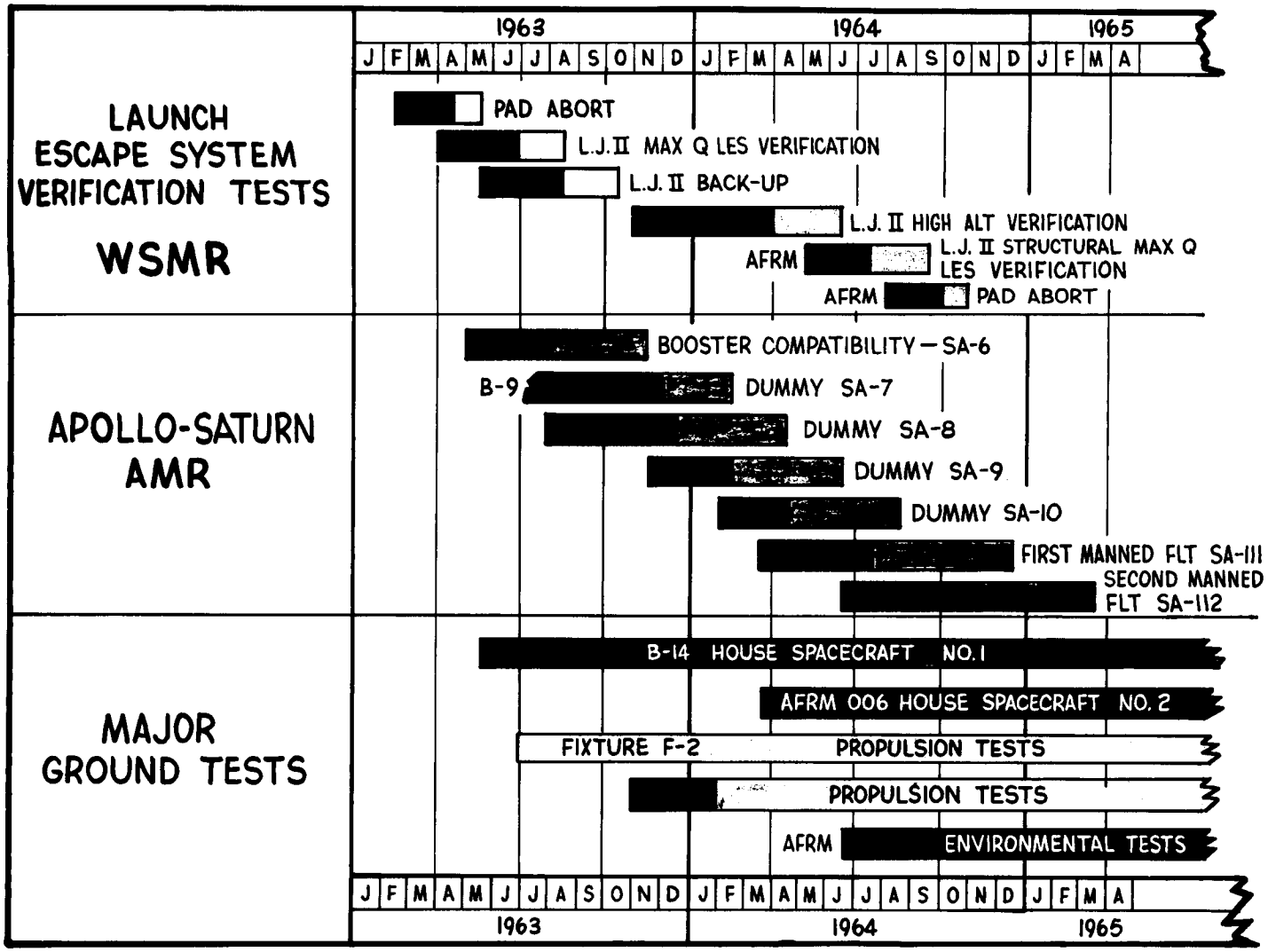
- CONDUCT ALL TESTS - MULTIPLE SYSTEMS IN S/C
- CONDUCT S/C DEVELOPMENT TEST FOR APOLLO ENGINEERING
- SUPPORT NASA ON LAUNCH OPERATIONS
- CONDUCT OFF-SITE TEST OPERATIONS

ORGANIZATION



10-62 AP19982

ATO PROGRAMS


1963
1964
1965
J F M A M J J A S O N D J F M A M J J A S O N D J F M A
LAUNCH ESCAPE SYSTEM VERIFICATION TESTS
WSMR
PAD ABORT
L.J.II MAX Q LES VERIFICATION
L.J. II BACK-UP
L.J. II HIGH ALT VERIFICATION
AFRM
L.J. II STRUCTURAL MAX Q LES VERIFICATION
AFRM
PAD ABORT
APOLLO-SATURN AMR
BOOSTER COMPATIBILITY — SA-6
B-9
DUMMY SA-7
DUMMY SA-8
DUMMY SA-9
DUMMY SA-10
FIRST MANNED FLT SA-111
SECOND MANNED FLT SA-112
MAJOR GROUND TESTS
B-14 HOUSE SPACECRAFT NO. 1
AFRM 006 HOUSE SPACECRAFT NO. 2
FIXTURE F-2
PROPULSION TESTS
PROPULSION TESTS
AFRM
ENVIRONMENTAL TESTS
J F M A M J J A S O N D J F M A M J J A S O N D J F M A
1963
1964
1965

10-62 AP 19983

MAJOR ACCOMPLISHMENTS

ITEM	DATE
• REVIEW OF GENERAL TEST PLAN AT HOUSTON	1,2 AUG 62
• REVISED MASTER PHASING SCHEDULE (DELETE ONE PAD ABORT B/P & TWO APOLLO/SATURN VEHICLES)	9 AUG 62
• INITIAL OPERATIONS REVIEW MEETING AT S & I D, DOWNEY	4,5 SEP 62
• REVISED MASTER PHASING SCHEDULE (ADD ONE PAD ABORT AFRM & REFURB B/P DELETE ONE APOLLO/SATURN VEHICLE)	18 SEP 62
• REISSUE OF GENERAL TEST PLAN TO NASA (3 VOLUMES)	30 SEP 62

FUTURE ACCOMPLISHMENTS

- REVIEW & REISSUE THE GENERAL TEST PLAN (SID 62-109)
- INITIATE TRAINING PROGRAM
- FINALIZE FACILITY REQUIREMENTS
- CONTINUE DEVELOPMENT OF DETAIL TEST PLANS
- ESTABLISH INITIAL FIELD OFFICES (WSMR & AMR)
- FINALIZE GSE CONCEPTS FOR BOILERPLATES & AIRFRAME OPERATIONS
- FINALIZE RANGE SUPPORT INFORMATION FOR TRANSMITTAL TO NASA

LOGISTICS RESPONSIBILITIES

SUPPORT MANUALS

SUPPLY SUPPORT

NASA TRAINING

TRAINER INSTRUCTOR MANUALS

TRAINER MAINTENANCE

PHOTO DOCUMENTATION

SUPPORT ANALYSIS & INTEGRATION

9-62 AP 19729A

LOGISTICS ACTIVITY 3RD QUARTER

SUPPLY SUPPORT

- 107 ITEMS IDENTIFIED & RESEARCHED FOR FSN B/P 1,2,3,19
- SCHEDULING & SHIPPING INSTRUCTIONS ISSUED FOR 107 ITEMS
- INVENTORY CONTROL PLANNING & PROCEDURES COMPLETED
- RESIDUAL DISPOSITION PLANNING & PROCEDURES COMPLETED
- SCHEDULE & RELEASE GSE FOR B/P 1,2,3,6,9,12,13,14,19,26

TRAINING

- TRAINING PLAN COMPLETELY REVISED
- EARLY COURSE DATA PROVIDED TO NASA
- SYSTEMS TRAINERS DELETED
- TRAINING AIDS EFFORT EXPANDED BECAUSE OF LOSS OF TRAINERS
- INSTRUCTOR MANUALS RESCHEDULED TO TRAINER DELIVERIES
- TRAINER MAINT & MOD PLANS INCLUDED IN TRAINING PLAN
- SYSTEMS TRAINING STARTED INCLUDING SOME NASA PERSONNEL

SUPPORT MANUALS

- STARTED WRITING C/O, MAINT. REPAIR MANUALS
- STARTED RECEIVING DATA FROM MAJOR SUBCONTRACTORS
- MINOR SUBCONTRACTOR REQMTS REVIEWED & SPECS SUBMITTED

SUPPORT ANALYSIS

- MAINTENANCE CONCEPT PUBLISHED
- MAINTENANCE PLAN PUBLISHED
- SUPPORT PLAN PUBLISHED
- SUPPORT ANALYSIS COMPLETED ON B/P 3, WORKING ON 6,9,12,13,14,19,26
- ALL IDENTIFIED GSE UNDER ANALYSIS
- SUPPORT ANALYSIS ON 3 SYSTEMS TRAINERS COMPLETED

LOGISTICS ACTIVITY IN 4th QUARTER

SUPPLY SUPPORT

- RELEASE TRAINERS
- RELEASE LONG LEAD SPARES FOR TRAINERS
- RELEASE SPARES FOR ADDITIONAL TEST ARTICLES
- RELEASE SPARES FOR ADDITIONAL GSE END ITEMS
- ALL ITEMS RELEASED AS LEAD TIME DICTATES

TRAINING

- CONTINUE RESEARCH & WRITING ON PART TASK TRAINER MANUALS
- INCREASE SCOPE & DEFINITION OF TRAINING PLAN
- INCREASE WORK EFFORT ON COURSE DEVELOPMENT
- ACCENTUATE DEVELOPMENT OF TRAINING DEVICES & AIDS

SUPPORT MANUALS

- INCREASE WRITING EFFORT ON C/O, MAINT. & REPAIR MANUALS
- IDENTIFY ADDITIONAL MINOR SUBCONTRACTOR REQUIREMENTS
- CONTINUE ADMINISTRATION OF MAJOR SUBCONTRACTOR INPUTS
- CONTINUE PHOTO DOCUMENTATION OF MILESTONES & MAJOR EVENTS

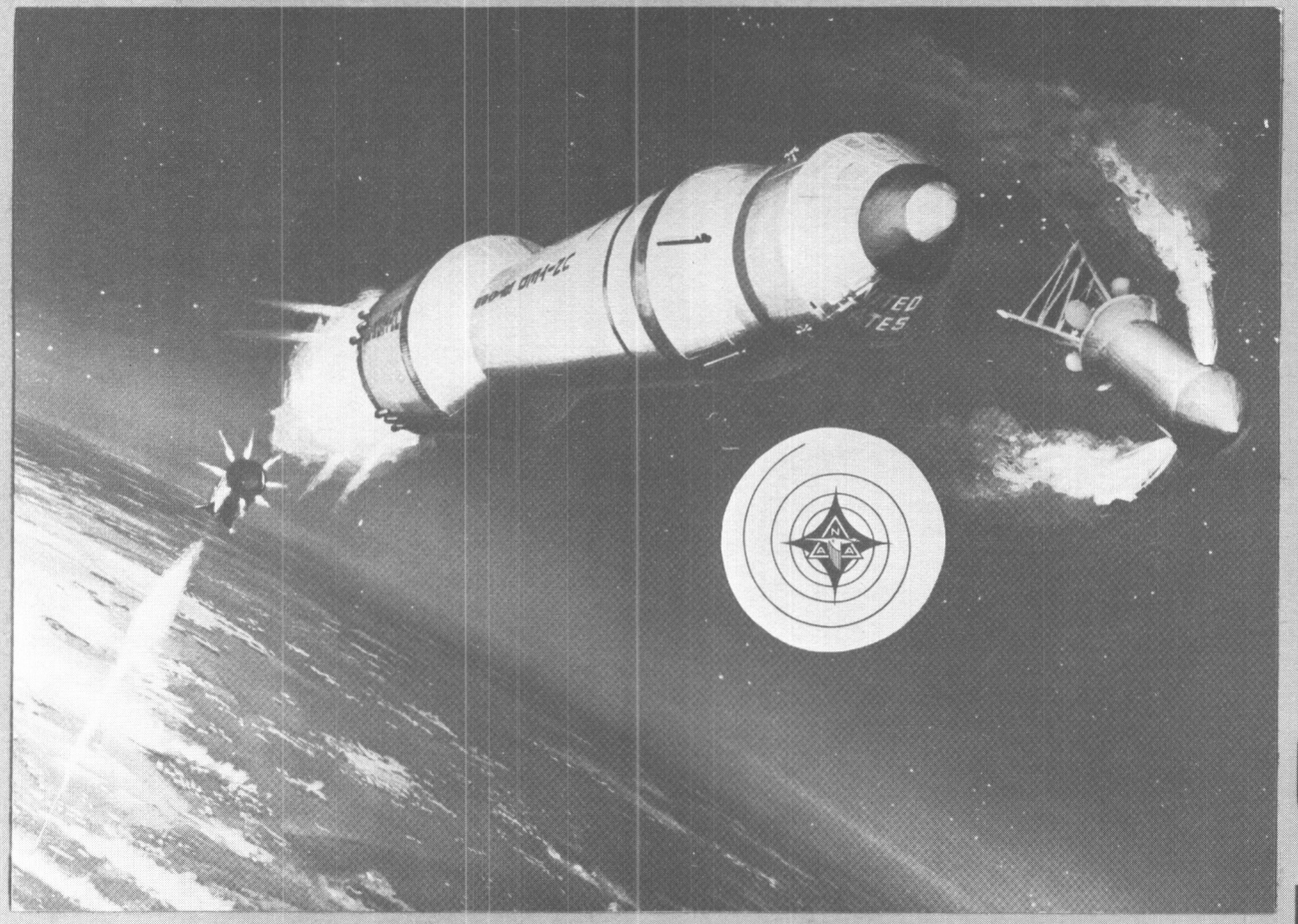
SUPPORT ANALYSIS

- COMPLETE SUPPORT ANALYSIS OF BOILERPLATE 6 & 9, 19
- CONTINUE WORK ON ADDITIONAL TEST ARTICLES
- CONTINUE WORK ON GSE END ITEMS AS EACH IS IDENTIFIED

FUTURE MAJOR MILESTONES (NEXT QUARTER)

- REVISED PROGRAM PLAN & SUBSIDIARY PLANS
- CONTRACT DEFINITIZATION
- FORMAL NASA MOCKUP INSPECTION
- MOCKUP COMPLETIONS 12, 9, 11, 2, 18
- BOILERPLATE COMPLETIONS 3, 2, 19
- GOSS EQUIP PREFLIGHT & INTERFACE SPECS
- 100% DESIGN RELEASE RCS ENGINE
- COMPLETE FAB PROTOTYPE RCS ENGINE-S/M

APOLLO



S&ID

NORTH AMERICAN AVIATION, INC.
SPACE AND INFORMATION SYSTEMS DIVISION

5-62 AP 11749C

MISSION REDEFINITION

- BASIC REQUIREMENTS
  - LUNAR ORBITAL RENDEZVOUS
  - 90,000-LB TRANSLUNAR INJECTION
  - 62,340 LBS FOR C/M + S/M
  - 24,460 LBS FOR LEM
  - 14-DAY MISSION
- CONFIGURATION EFFECTS
  - PROPELLANT TANKS SIZED FOR 45,000 LBS
  - RADIATORS FIXED
  - RADAR DELETED
  - AIRLOCK DELETED

ACCOMPLISHMENTS

LES CRITERIA ESTABLISHED

REDESIGN TO PASSIVE LES

18 WIND TUNNEL TESTS COMPLETED

INITIAL ESTIMATES OF AIR LOADS FOR ALL SPACE-VEHICLE CONFIGURATIONS

REVISED TRAJECTORIES FOR HEAT-SHIELD DESIGN

CHANGE TO ABLATIVE C/M RCS ENGINE

C/M RCS DUTY CYCLES & FUEL REQUIREMENTS ESTABLISHED

60:1 EXPANSION RATIO FOR S/M ENGINE

C/M, S/M & ADAPTER CONFIGURATIONS REDEFINED

S/M RCS PLUME HEATING ANALYSIS

EBW/HOT-WIRE PYROTECHNIC SELECTION

CHANGE TO 5 PSI 100% O_2 ATMOSPHERE

10-62 AP22124

ACCOMPLISHMENTS (CONT)

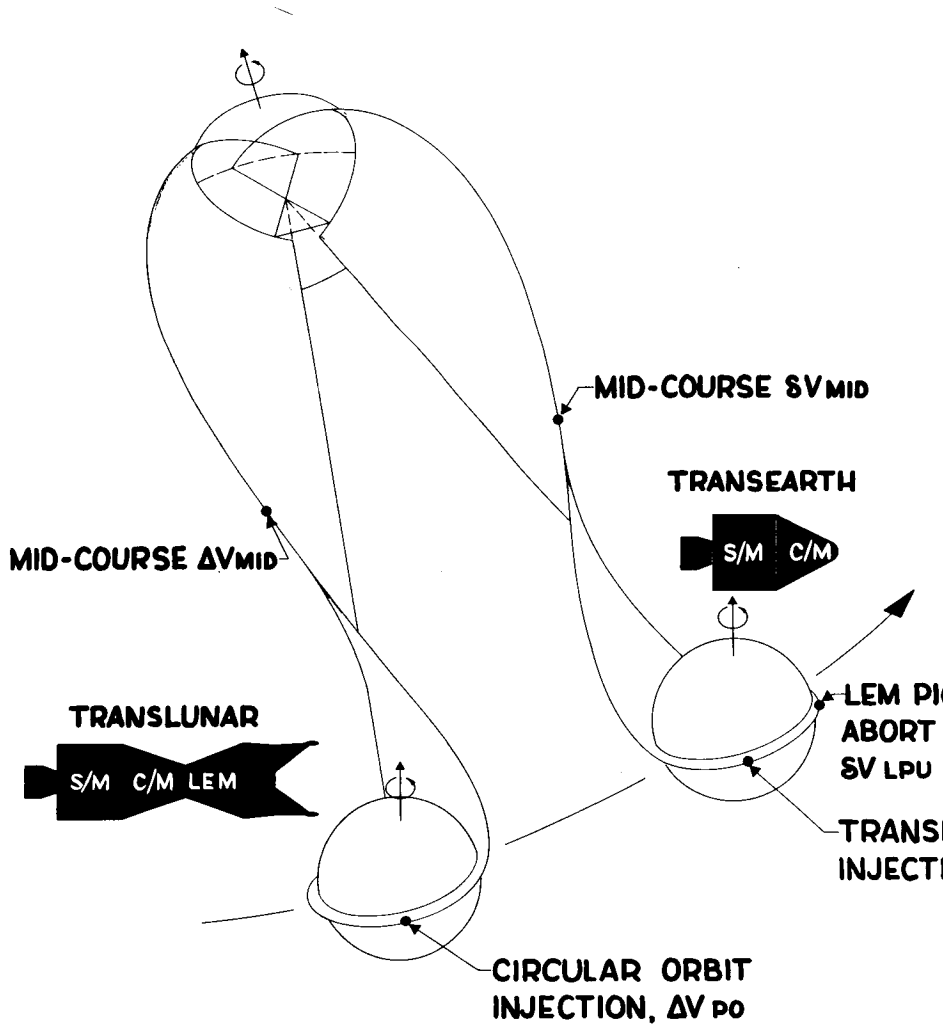
SCS SIMPLIFIED
LIFE SYSTEMS TESTS OF CABIN ARRANGEMENTS
CREW EGRESS TESTS
REQUIREMENTS FOR SURVIVAL KIT
ENTRY MAN-IN-LOOP DYNAMIC ANALYSIS
TRADE-OFF COMPARISON OF MODULATION TECHNIQUES FOR TELECOMMUNICATIONS
COLD-PLATE HEAT-TRANSFER TESTS CORRELATED WITH ANALYSIS
LITTLE JOE II INTERFACES DEFINED
PRELIMINARY C-1 INTERFACES DEFINED
HARDWARE DEFINITIONS REVISED
DESIGN RELEASE OF HANDLING GSE FOR B/P 1, 3, 6, 19
EXTENSIONS TO SPACE-TRAJECTORY ERROR ANALYSIS
RELIABILITY PROGRAM & TEST PLANS APPROVED BY NASA

TECHNOLOGY OUTLINE

- ΔV
- S/M SIZING
- SCS
- ENTRY
- L/D
- CG
- AERO TESTING

10-62 AP 22126

CHARACTERISTIC VELOCITIES



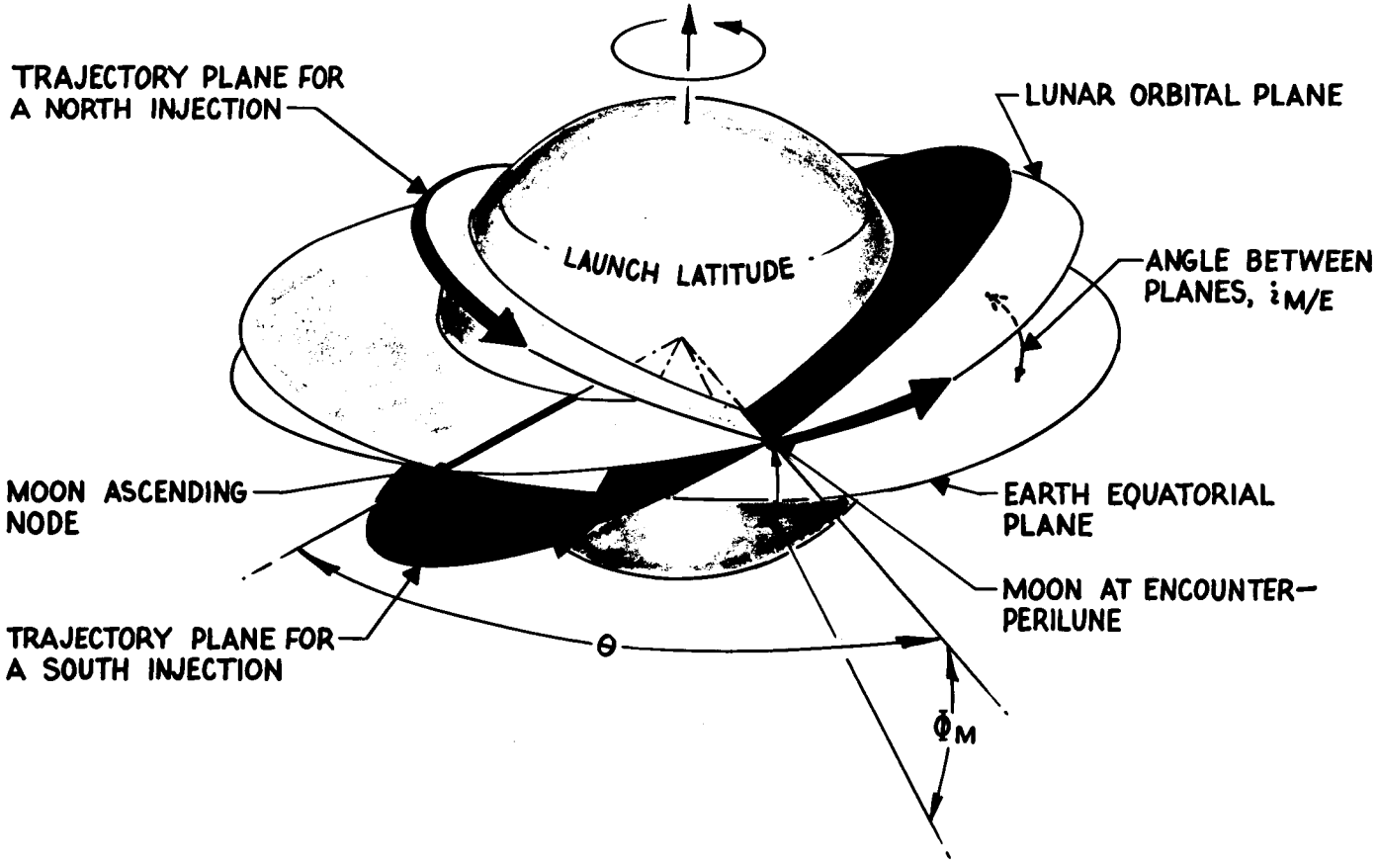
NASA ΔV VALUES, FPS (PERILUNE ALT. = 80 NMI)	
TRANSLUNAR	
ΔV MID	300
ΔV PO	3130
*ΔV PC	100
SUB-TOTAL	3530
C/A, 3%	106
PAD, 7%	247
TOTAL	3883
TRANSEARTH	
δV LPU	455
δV PO/PC	3610
δV MID	300
SUB-TOTAL	4365
C/A, 3%	131
PAD, 7%	305
TOTAL	4801

*ADDITIONAL PLANE CHANGE CAPABILITY

10-62 AP 22028

DEFINITIONS

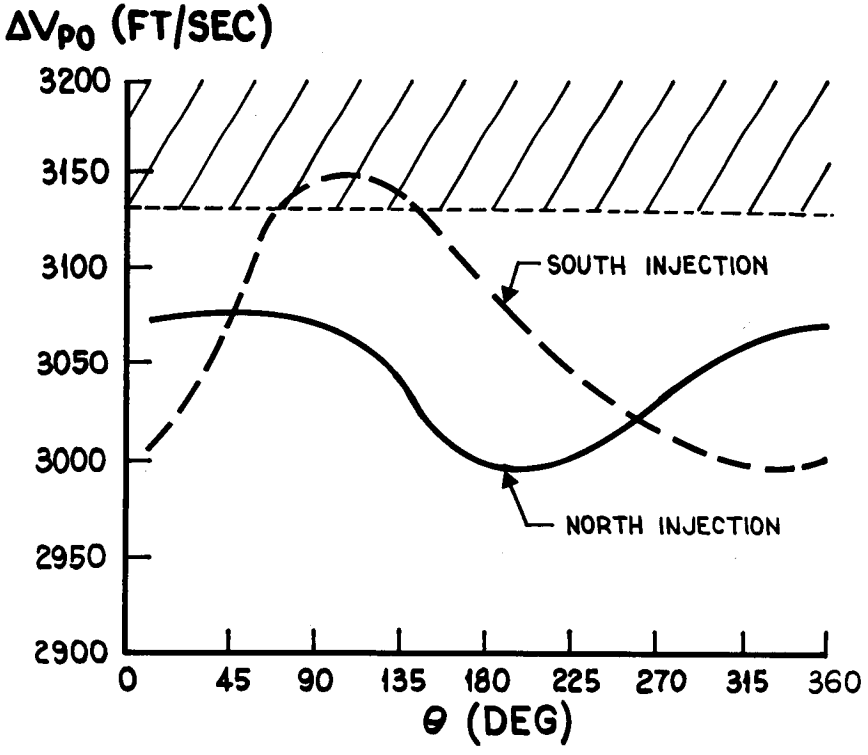
1. TIME OF MONTH, Θ
2. NORTH & SOUTH INJECTIONS
3. INCLINATION, $i_{M/E}$
4. DECLINATION, Φ_M



10-62 AP 22005

TYPICAL VARIATION OF CIRCULAR ORBIT INJECTION REQUIREMENTS

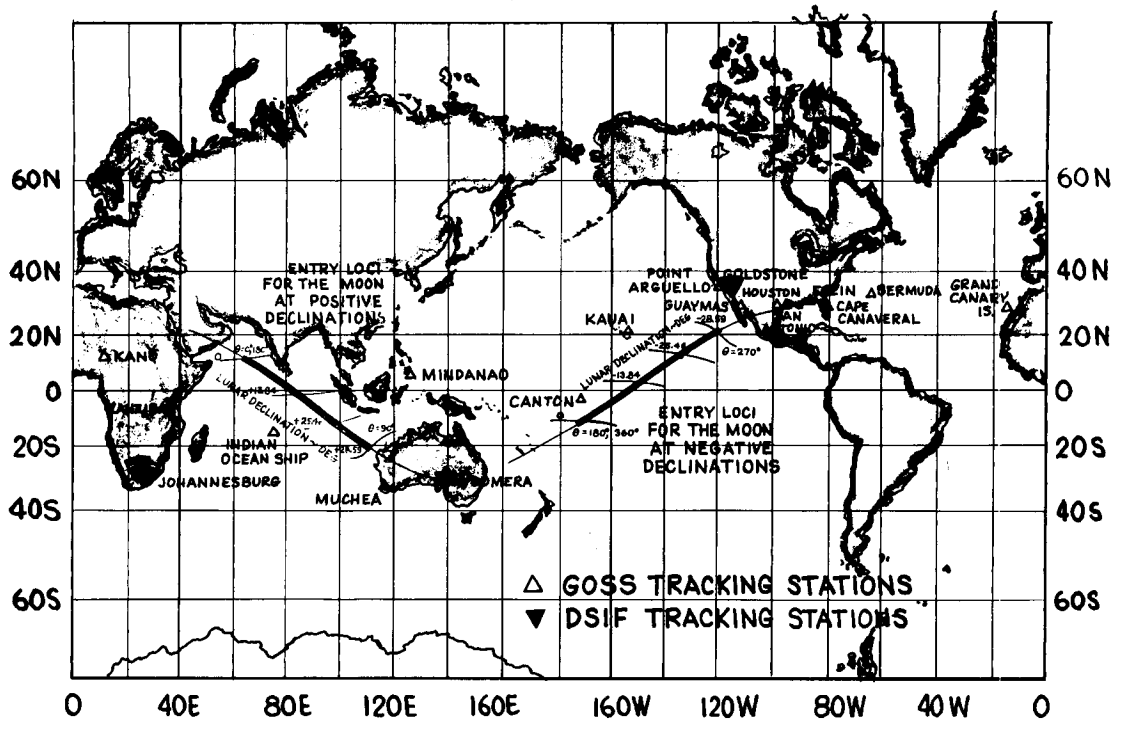
1. JANUARY 1967
2. FREE RETURN
3. NO PLANE CHANGE
4. LANDING AT SEA OF TRANQUILITY



10-62 AP22027

TRANSEARTH ENTRY LOCI

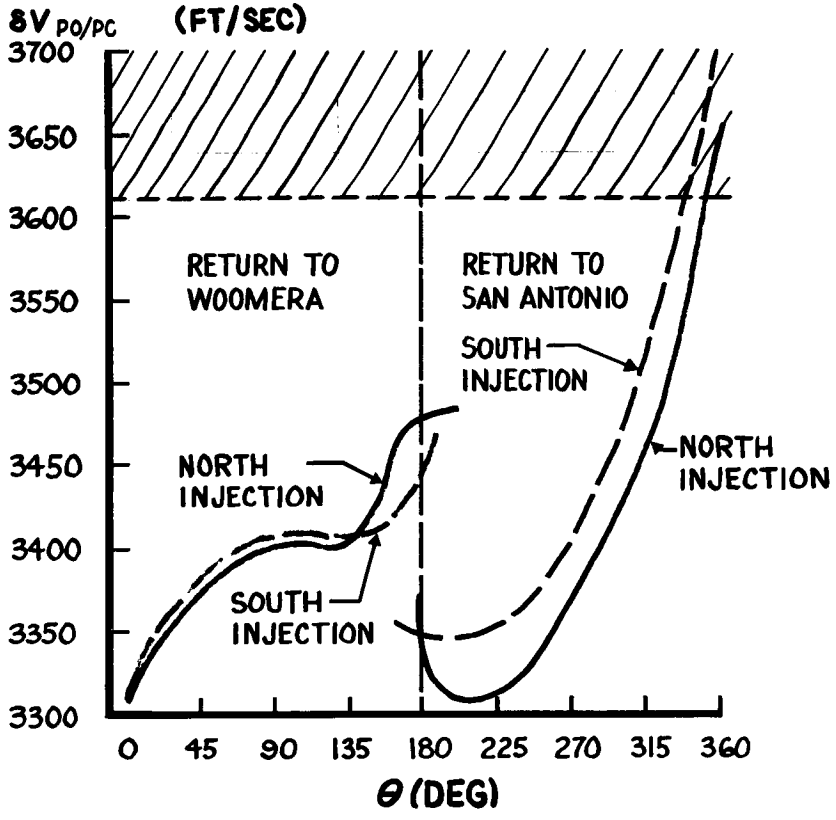
NOTE: INCLINATION TO EQUATORIAL PLANE=34 DEG



10-62 AP22132

TYPICAL VARIATION OF TRANSEARTH INJECTION REQUIREMENTS

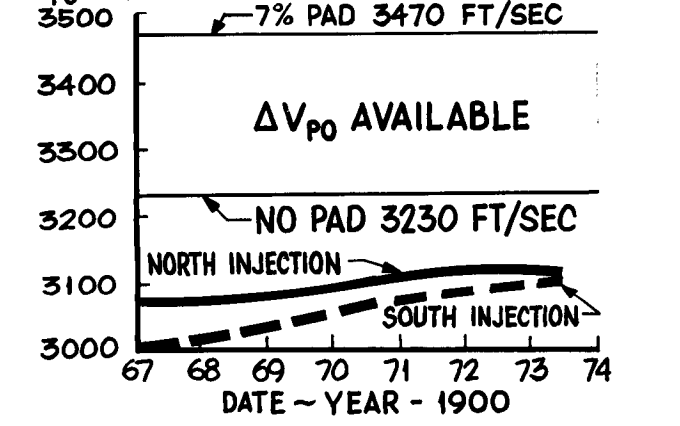
NOTE: 1. JAN 1967
2. MAX OF TWO DAYS IN LUNAR ORBIT
3. TRANSEARTH TIME = 60 HRS
4. RETURN ALONG GOSS TRACK

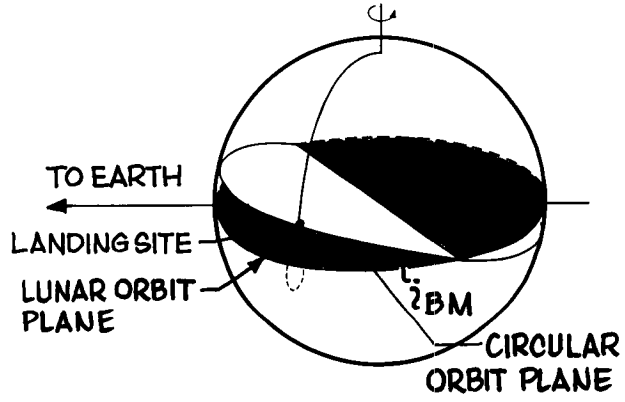


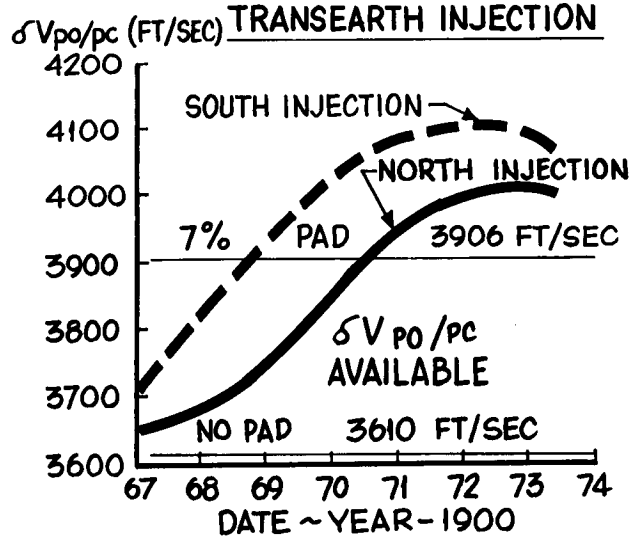
10-62-AP22026

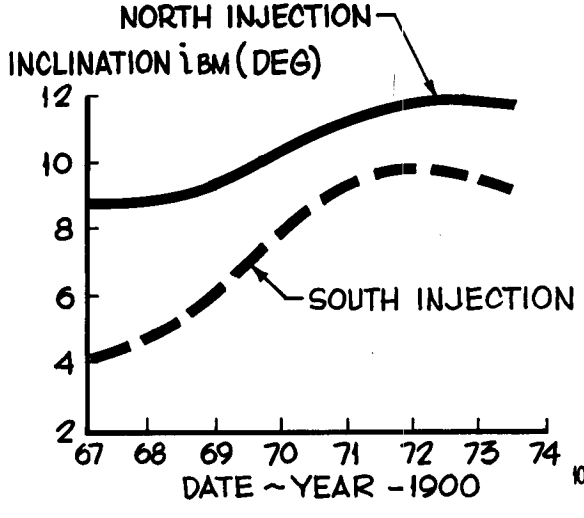
YEARLY VARIATION OF ΔV REQUIREMENTS

1. Θ = 360 DEG
2. LANDING AT SEA OF TRANQUILITY
3. MAX OF TWO DAYS IN LUNAR ORBIT
4. RETURN ALONG GOSS TRACK
5. FREE RETURN









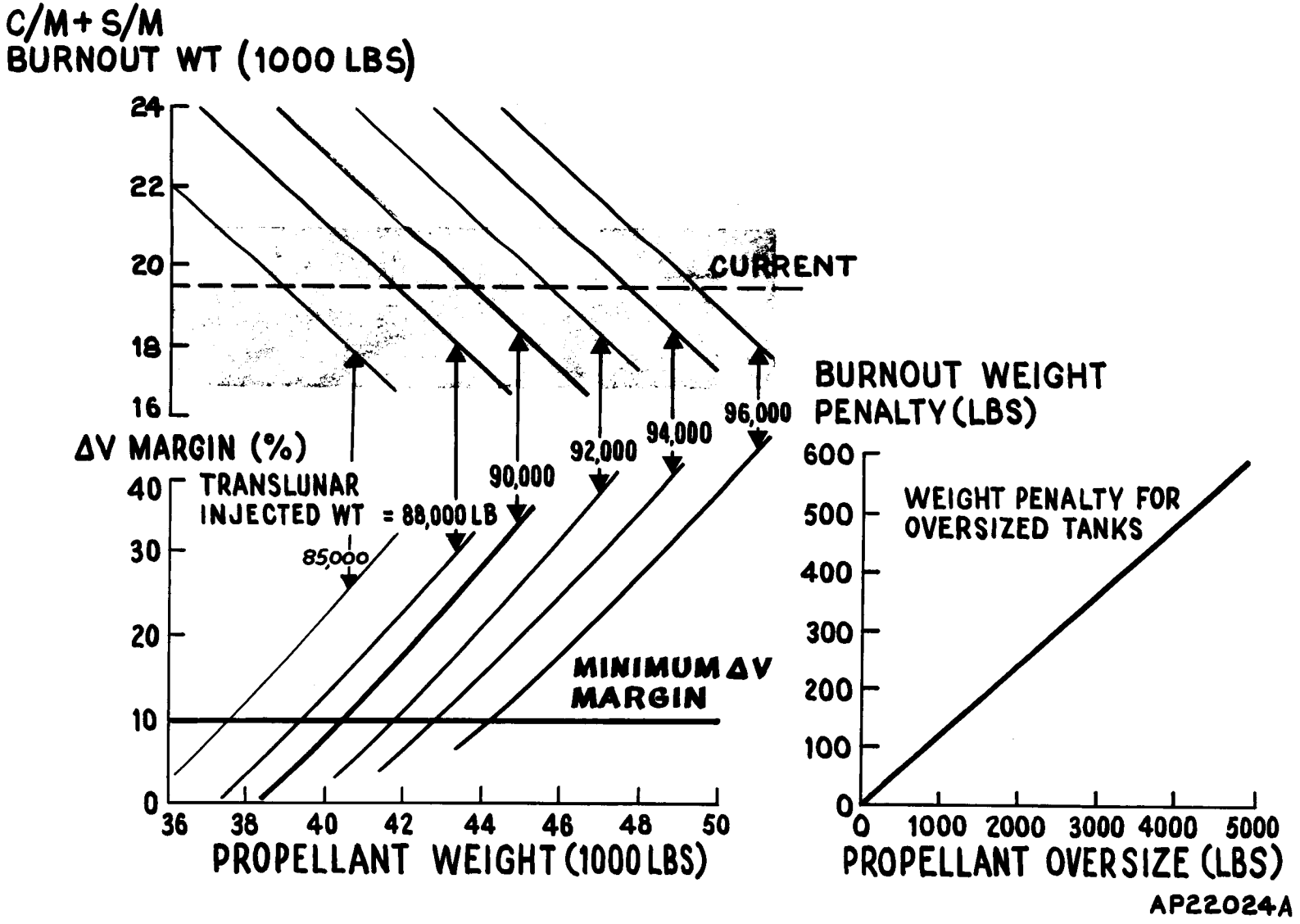
10-62 AP 22025

S/M SIZING

10-62 AP 19992

SERVICE MODULE SIZING

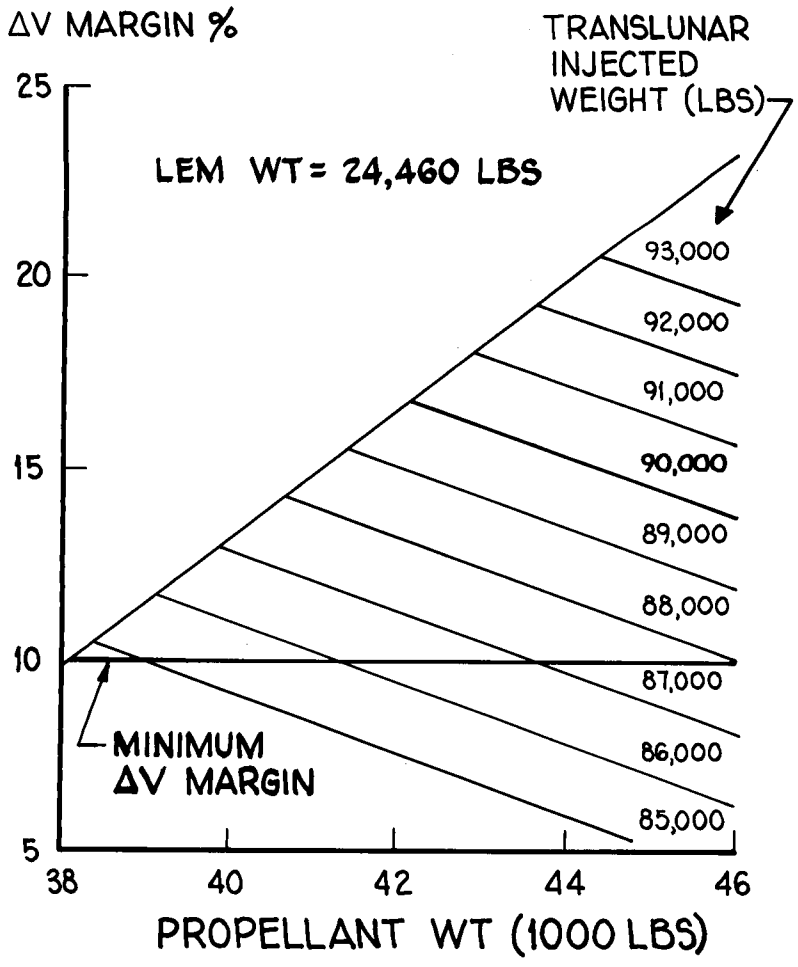
LEM WT = 24,460 LB
ADAPTER WT = 3000 LB



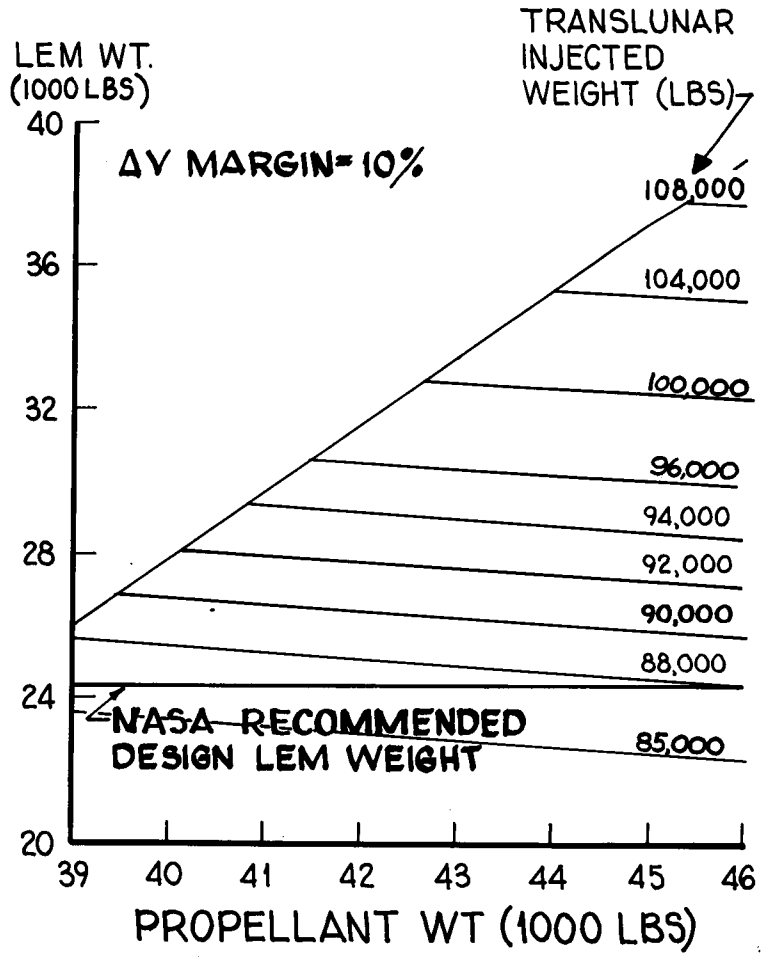
AP22024A

PROPELLANT CAPACITY TRADEOFFS

MAXIMUM ΔV MARGIN

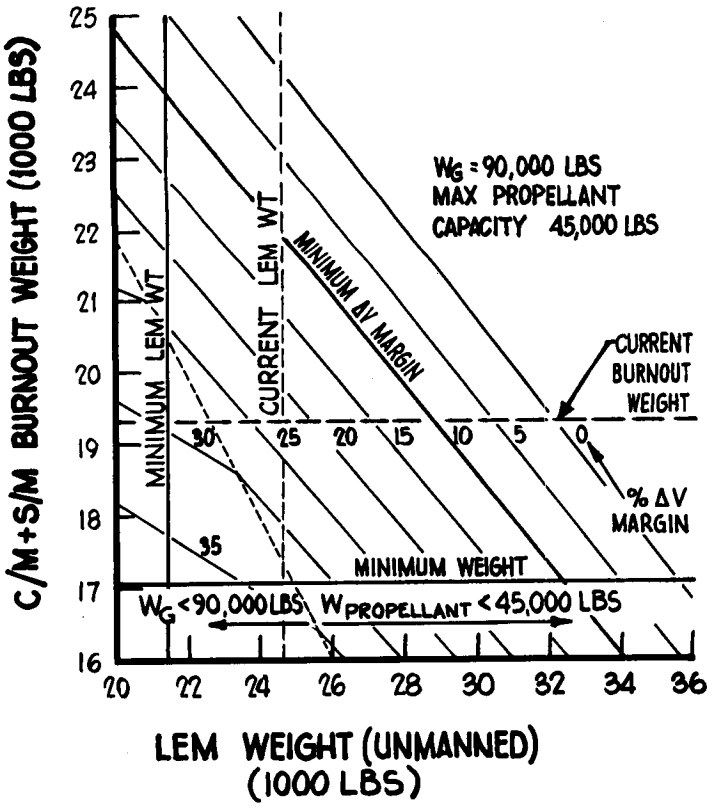


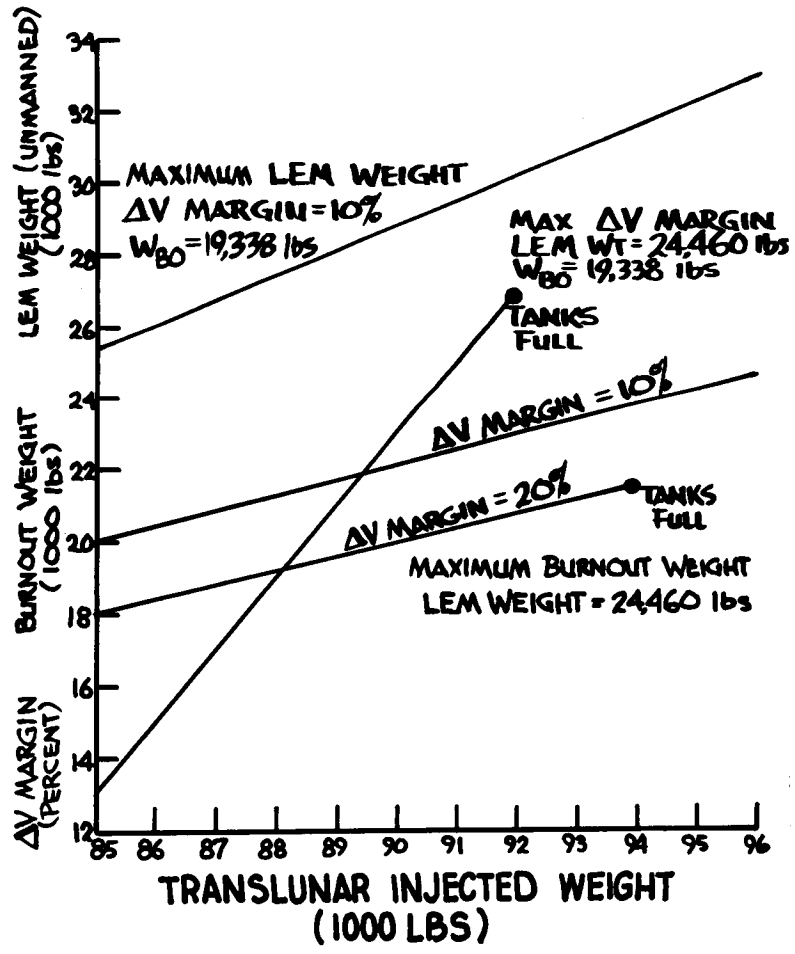
MAXIMUM LEM WT



10-62 AP22023A

CURRENT DESIGN & PERFORMANCE


C/M+S/M BURNOUT WEIGHT (1000 LBS)
LEM WEIGHT (UNMANNED) (1000 LBS)
W_G = 90,000 LBS
MAX PROPELLANT CAPACITY 45,000 LBS
MINIMUM LEM WT
CURRENT LEM WT
MINIMUM ΔV MARGIN
CURRENT BURNOUT WEIGHT
% ΔV MARGIN
MINIMUM WEIGHT
W_G < 90,000 LBS $W_{PROPELLANT}$ < 45,000 LBS



10-62 AP22022A

SCS

10-62 AP 19991

SCS MODES

MONITOR

G&N ATTITUDE

SCS ATTITUDE

SCS LOCAL VERTICAL

- G&N LARGE ΔV
- G&N SMALL ΔV

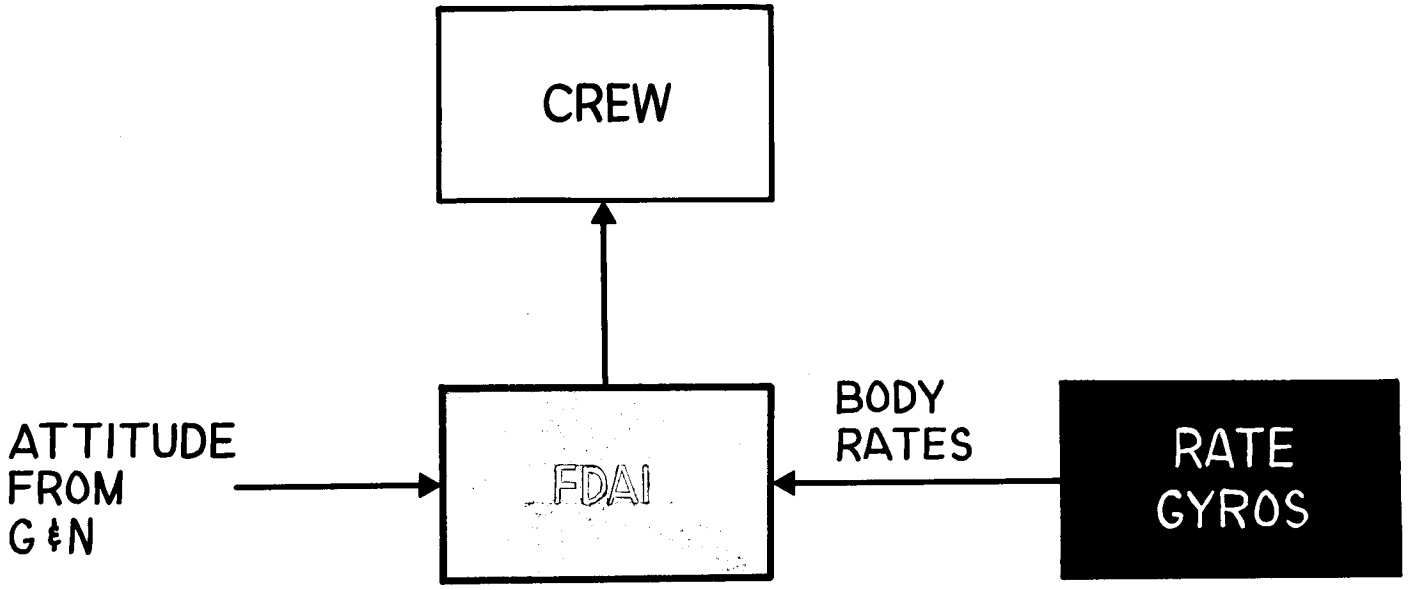
- SCS LARGE ΔV
- SCS SMALL ΔV

G&N ENTRY ATTITUDE

SCS ENTRY ATTITUDE

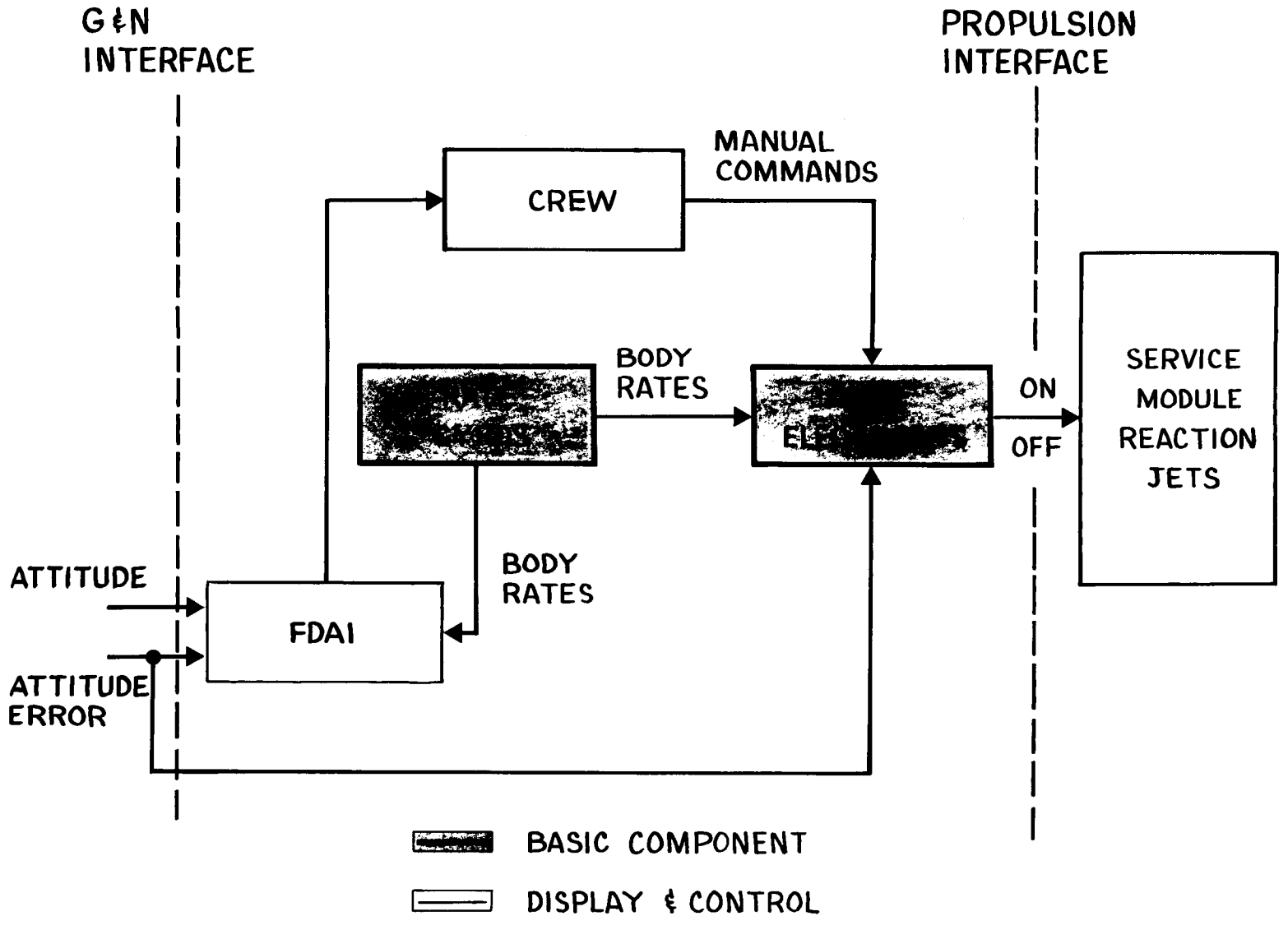
10-62 AP22021

MONITOR MODE



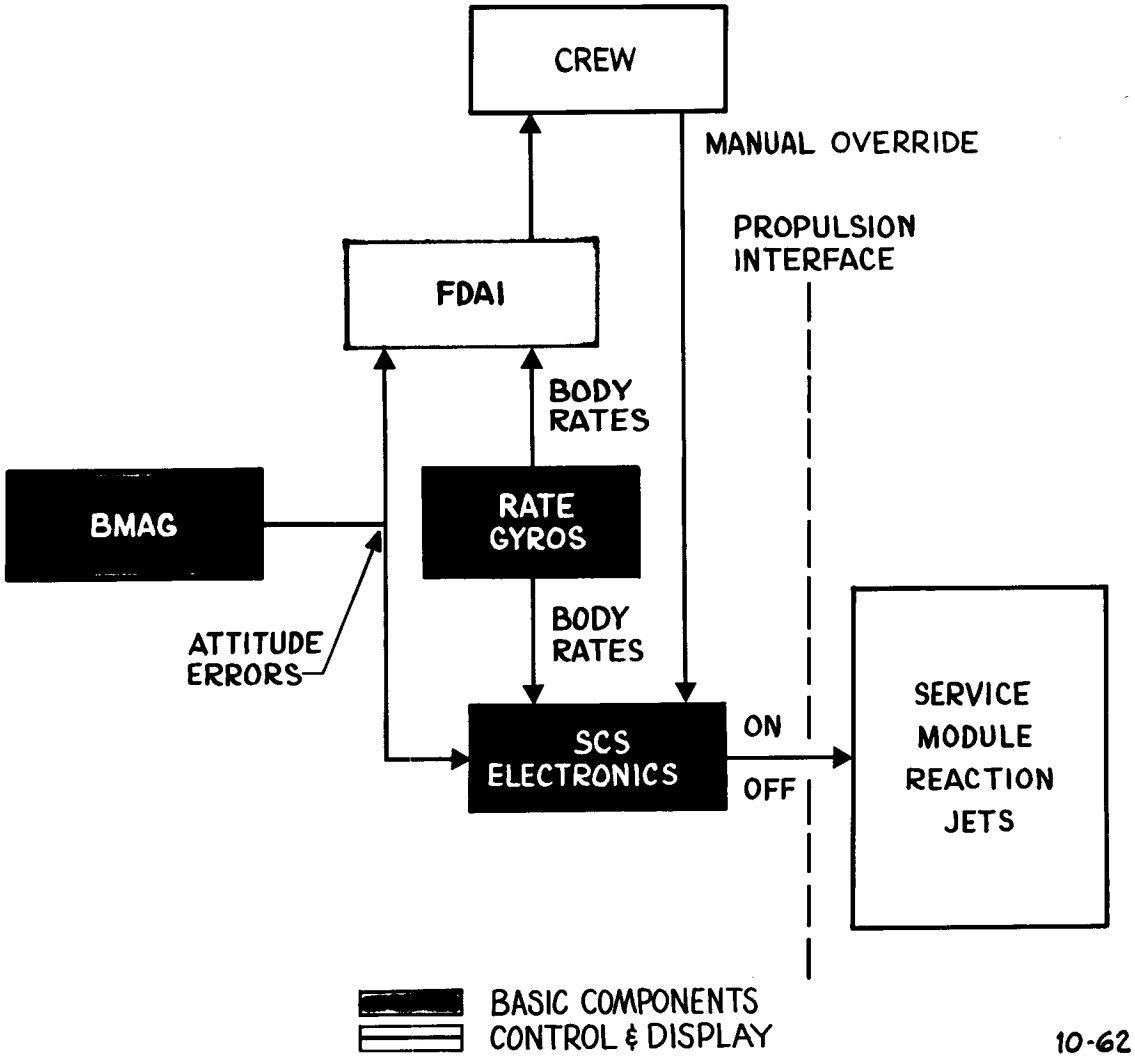
10-62 AP22013

G&N ATTITUDE MODE



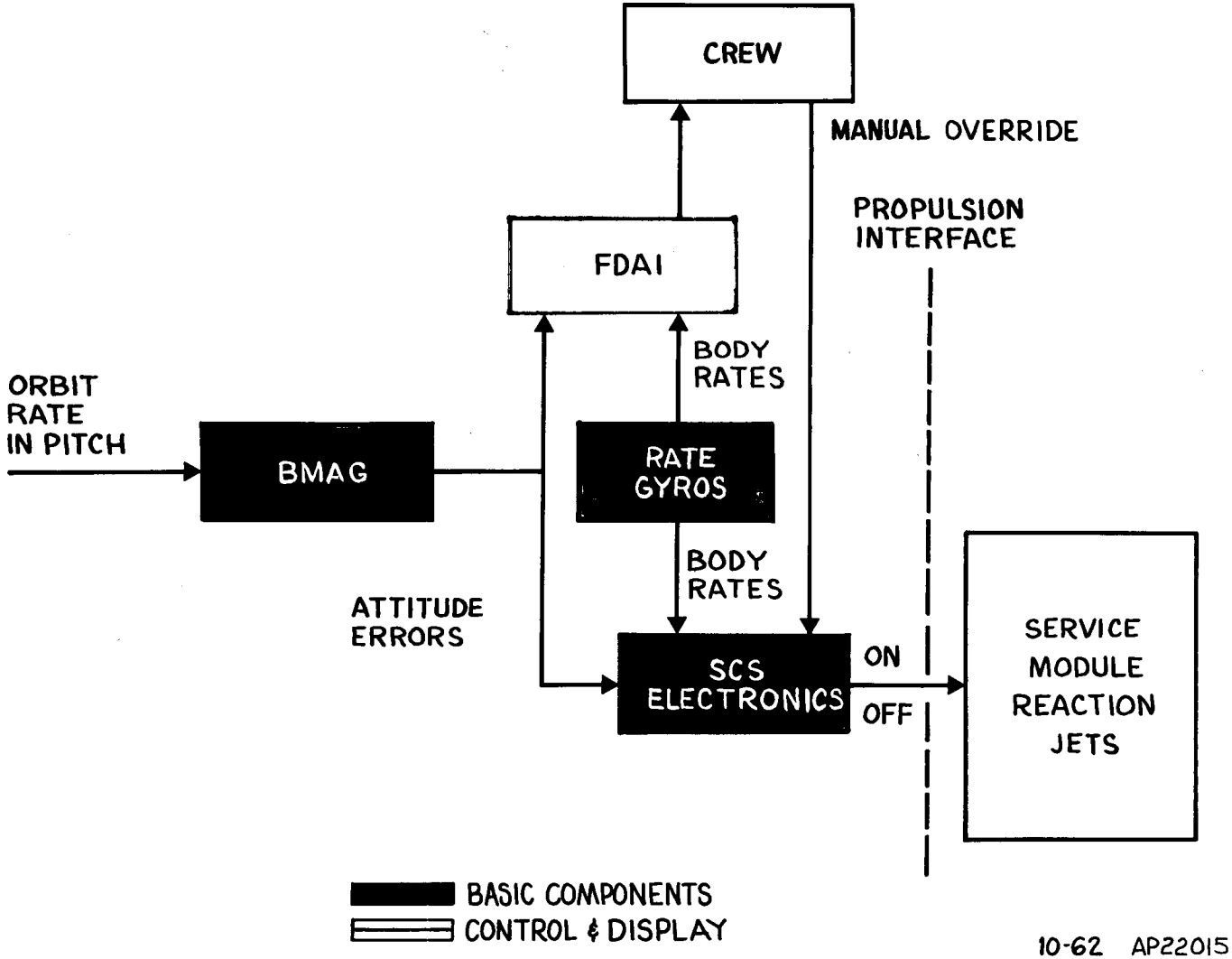
10-62 AP22014

SCS ATTITUDE MODE



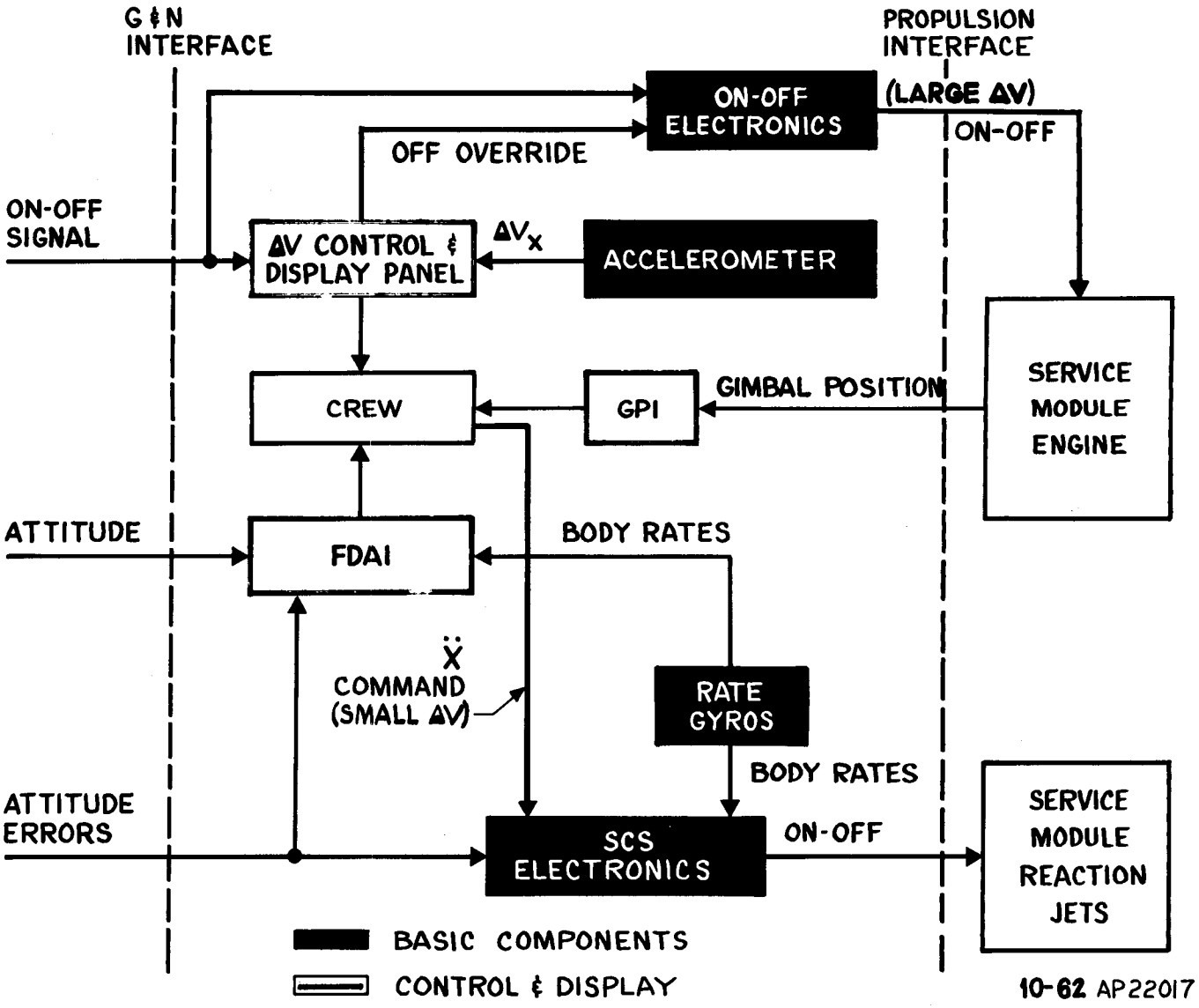
10-62 AP22016

SCS LOCAL VERTICAL MODE



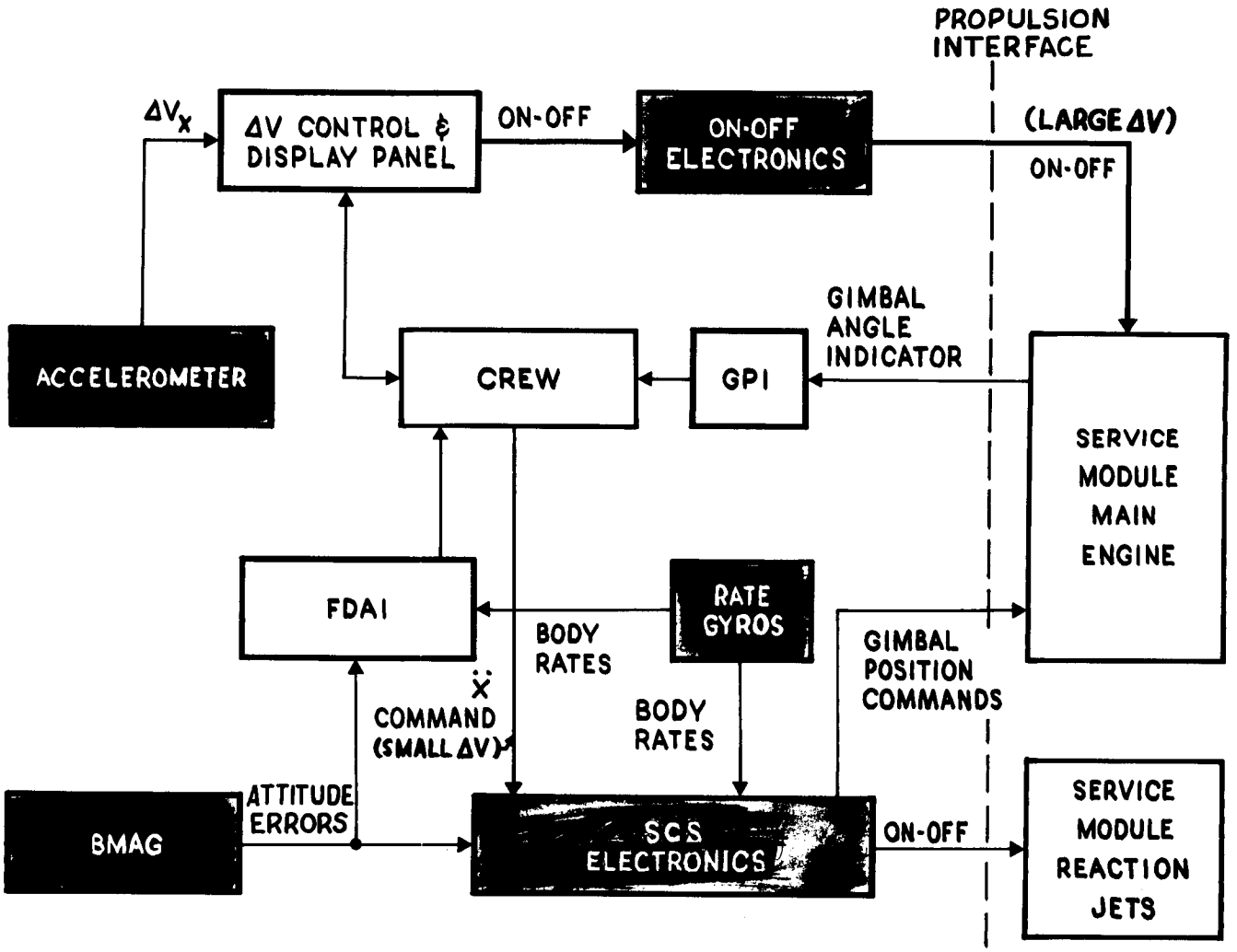
10-62 AP22015

G&N ΔV MODE



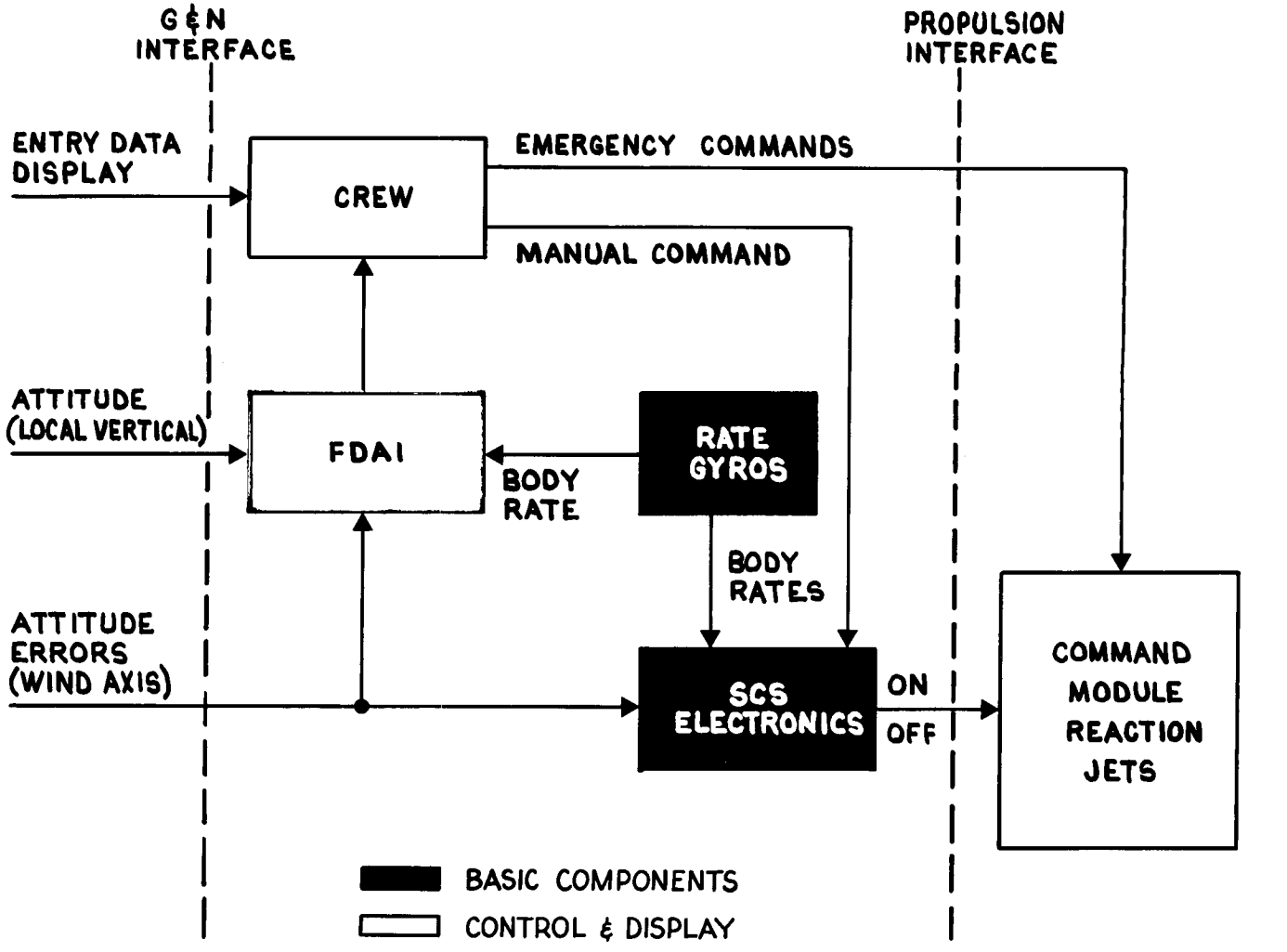
10-62 AP22017

SCS ΔV MODE



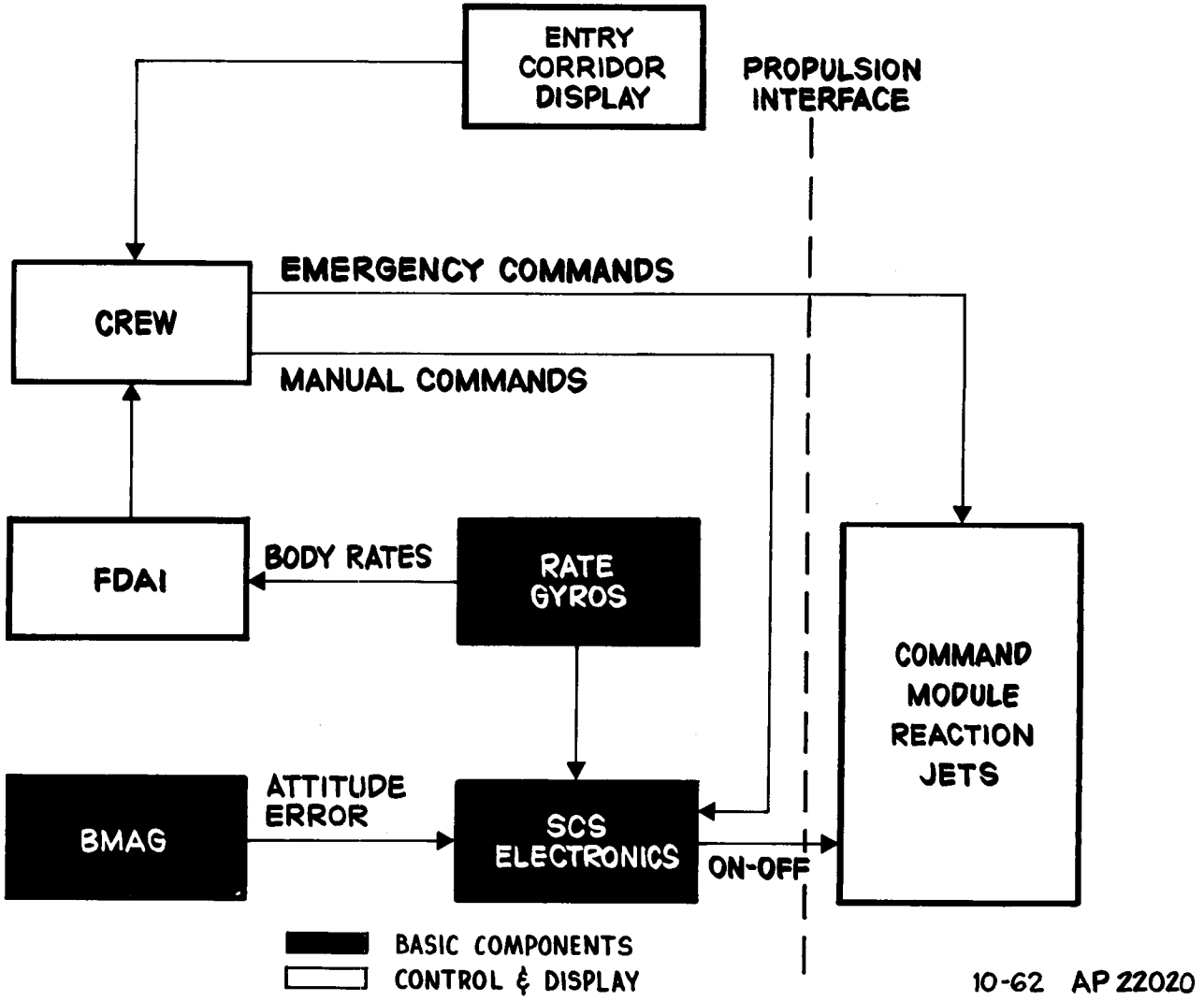
10-62 AP 22018

G&N ENTRY MODE



10-62 AP22019

SCS ENTRY MODE



10-62 AP 22020

ENTRY

10-62 AP 19990

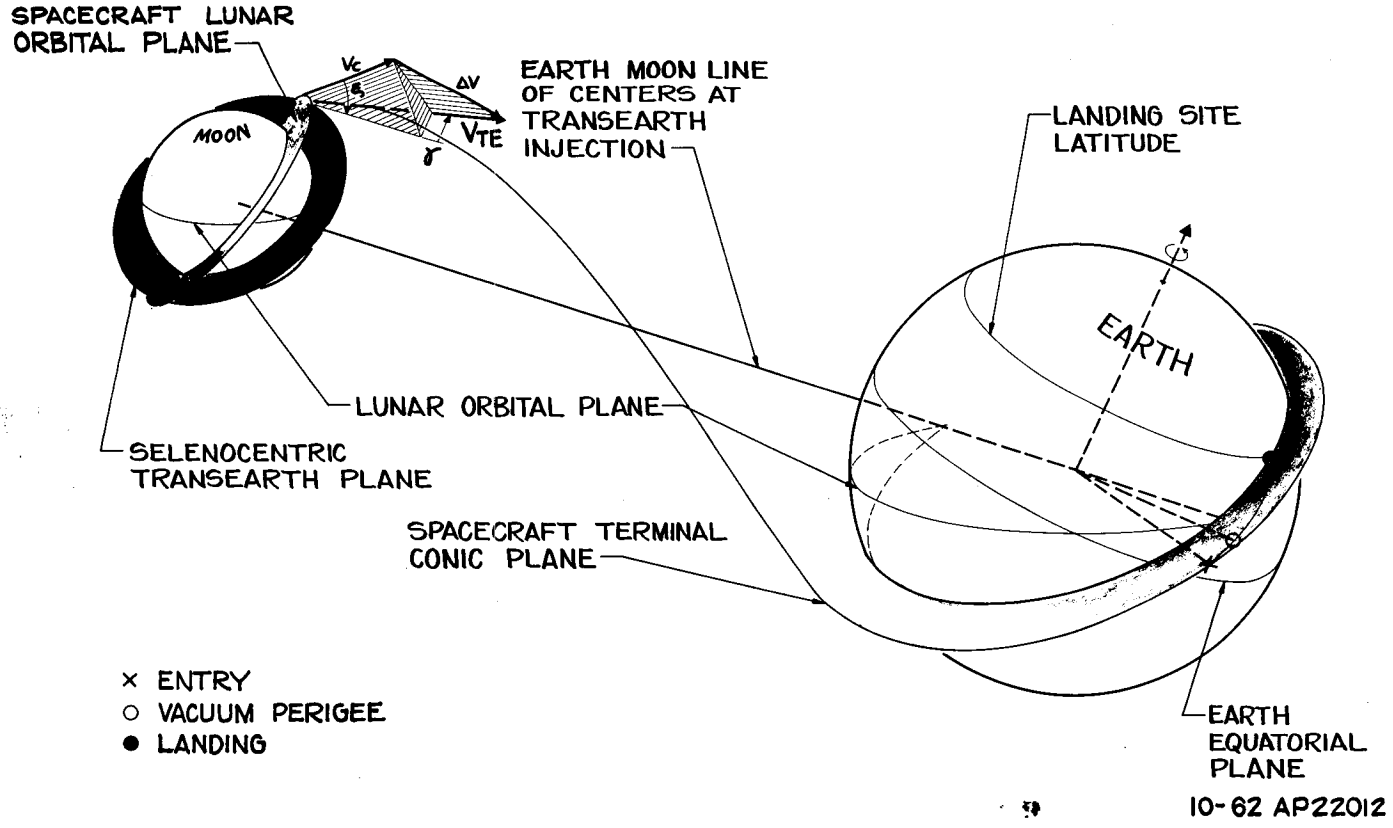
TRANSEARTH INJECTION CONSTRAINTS

MOON:

1. INJECTION EPOCH
2. INJECTION VELOCITY (V_{TE})
3. PLANE CHANGE ANGLE (ε)
4. INJECTION FLIGHT PATH ANGLE (γ)

EARTH

1. PERIGEE
2. INCLINATION
3. PERIGEE EPOCH



10-62 AP22012

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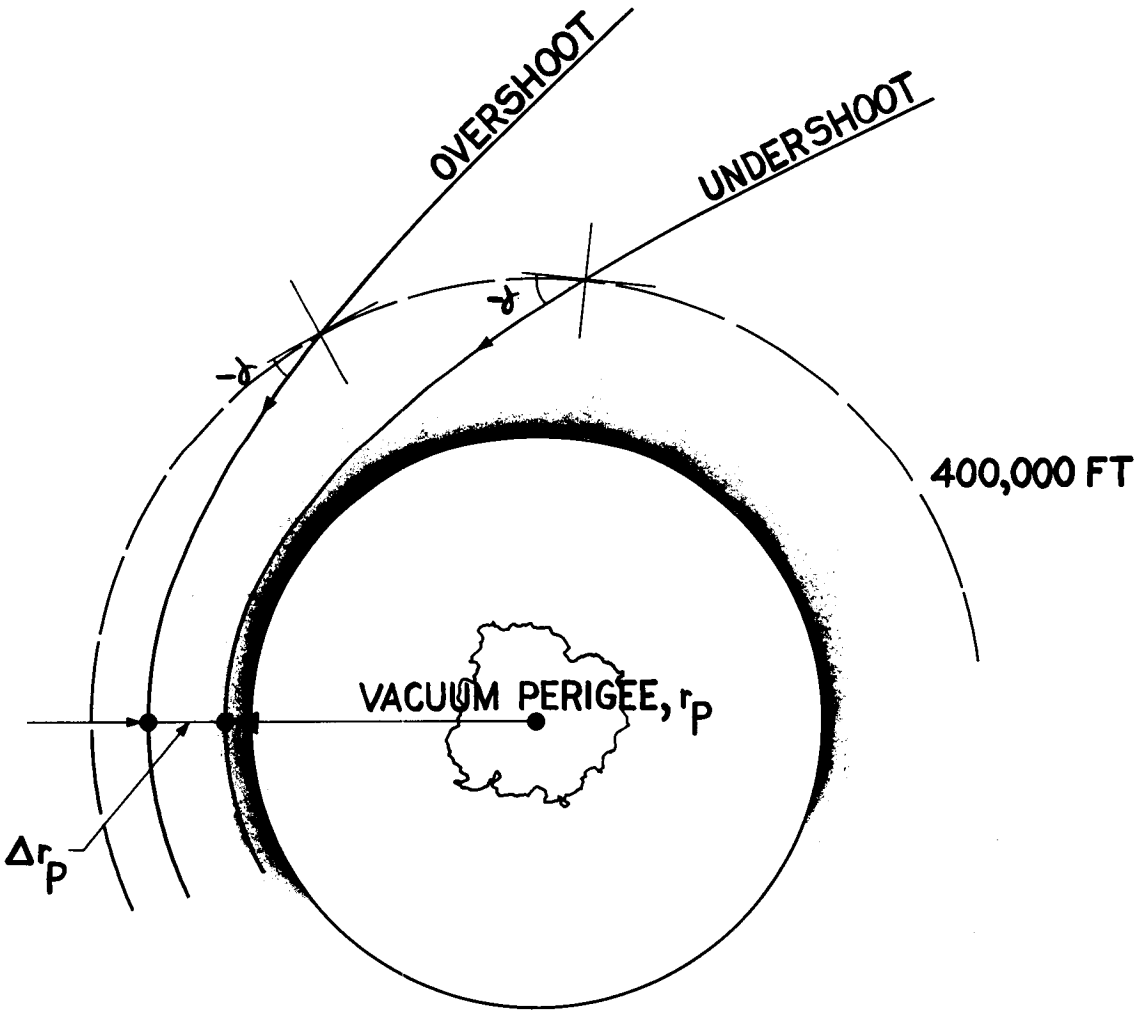
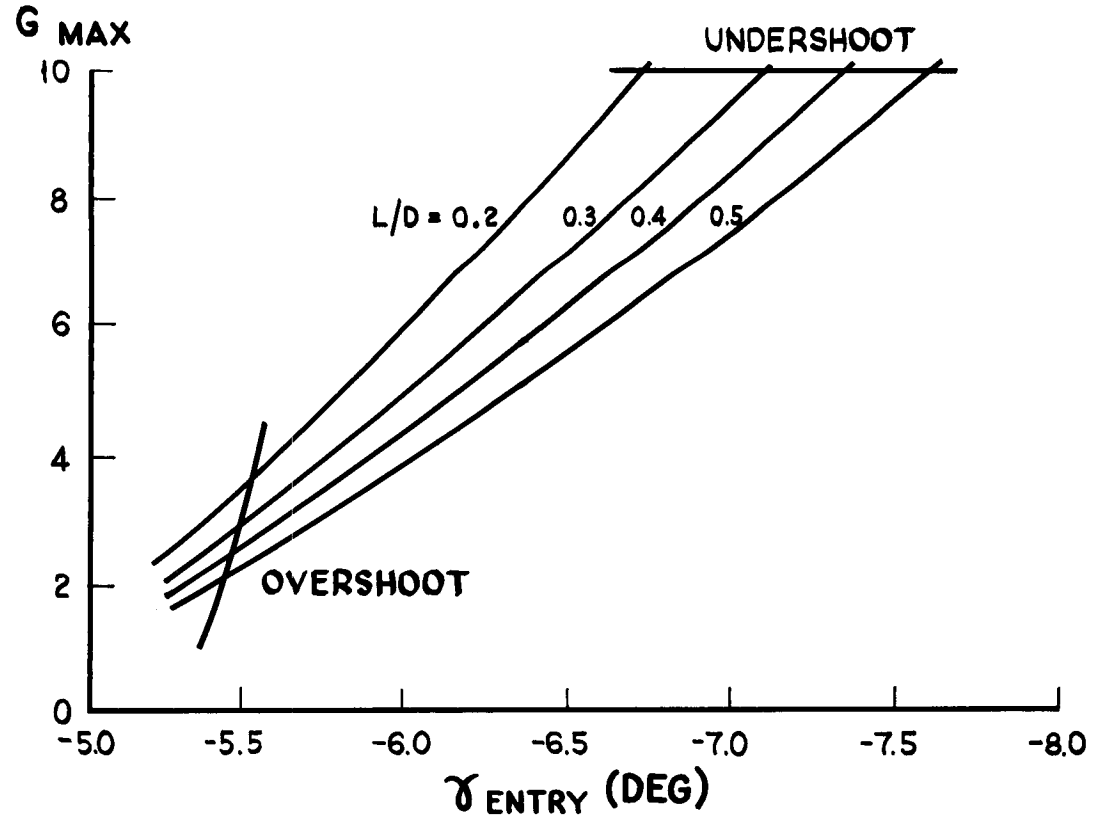


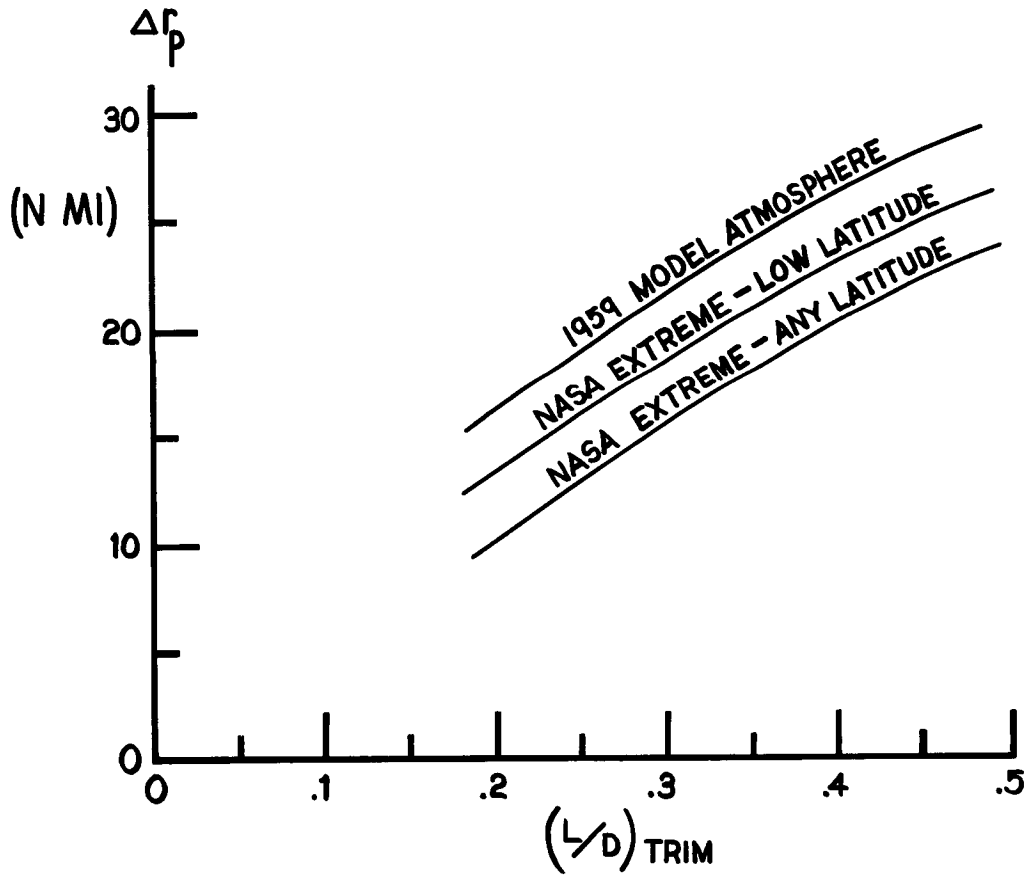
10-62 AP22011

ENTRY CORRIDOR



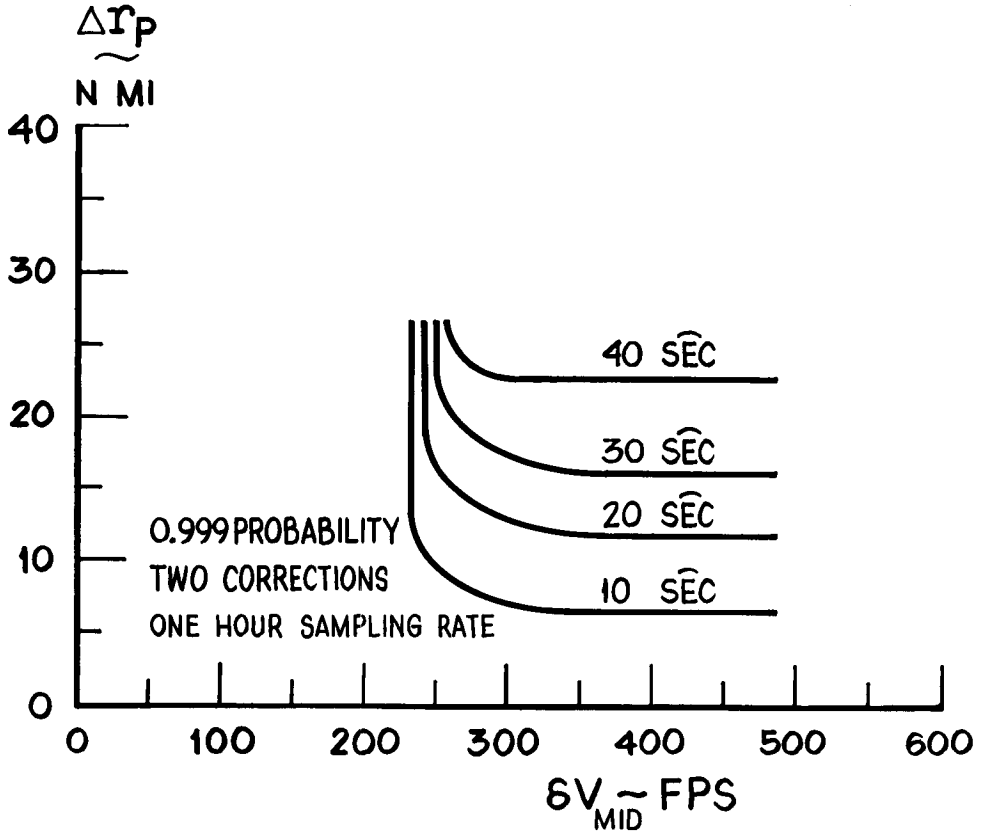
10-62 AP22010

CORRIDOR LIMITS

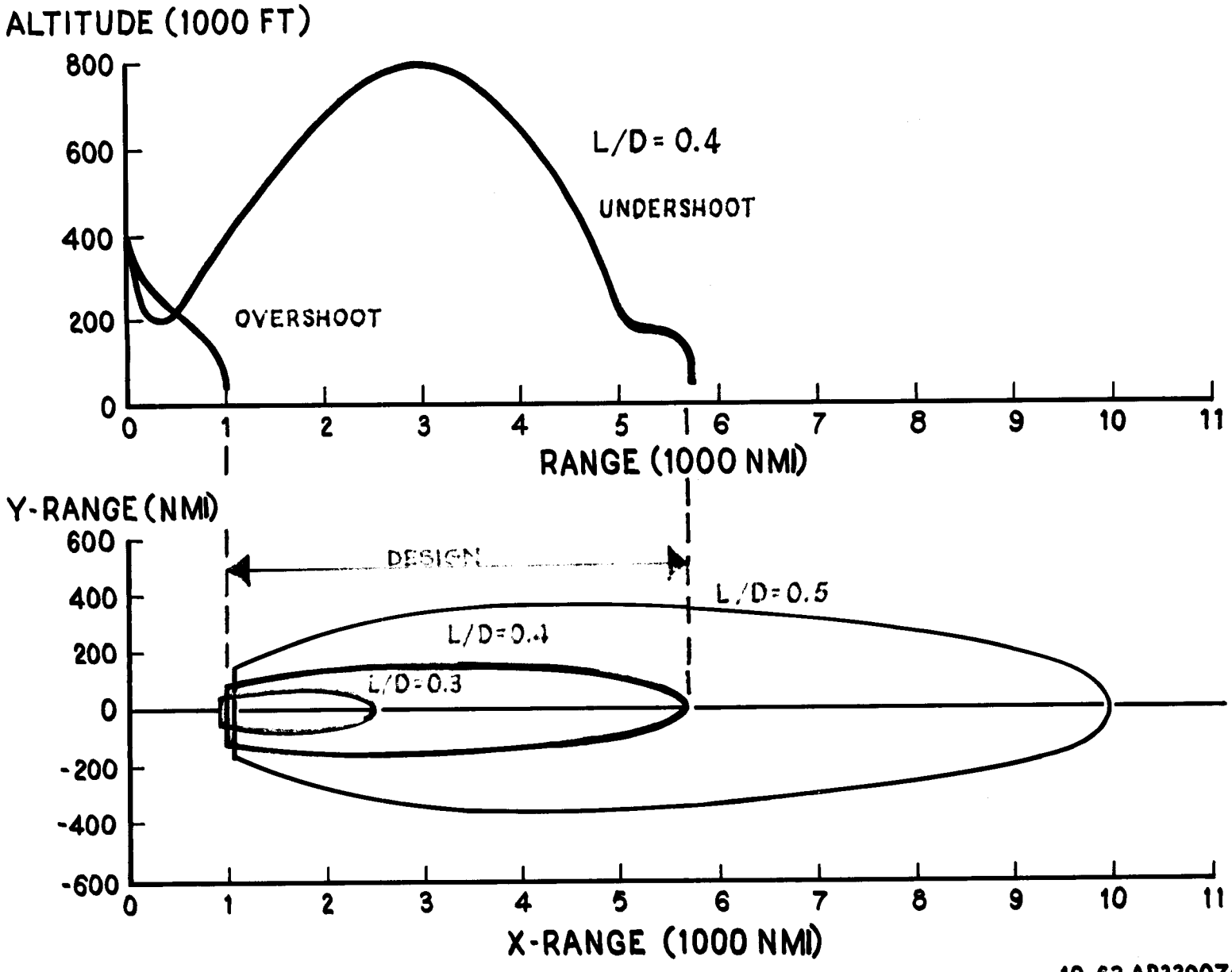


10-5 AP 22009

CORRIDOR REQUIREMENTS



FOOTPRINT



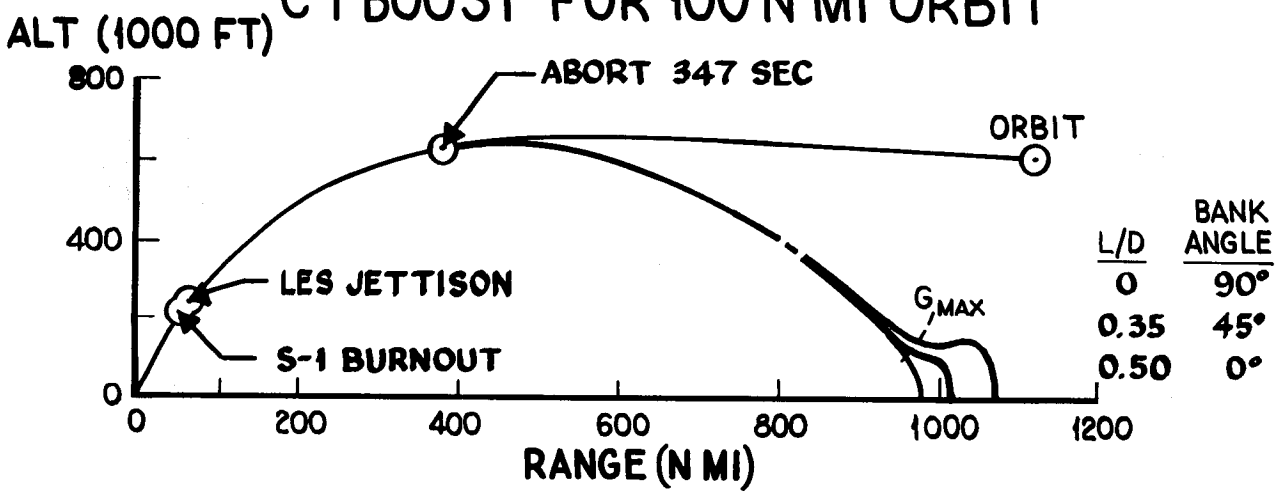
10-62 AP22007A

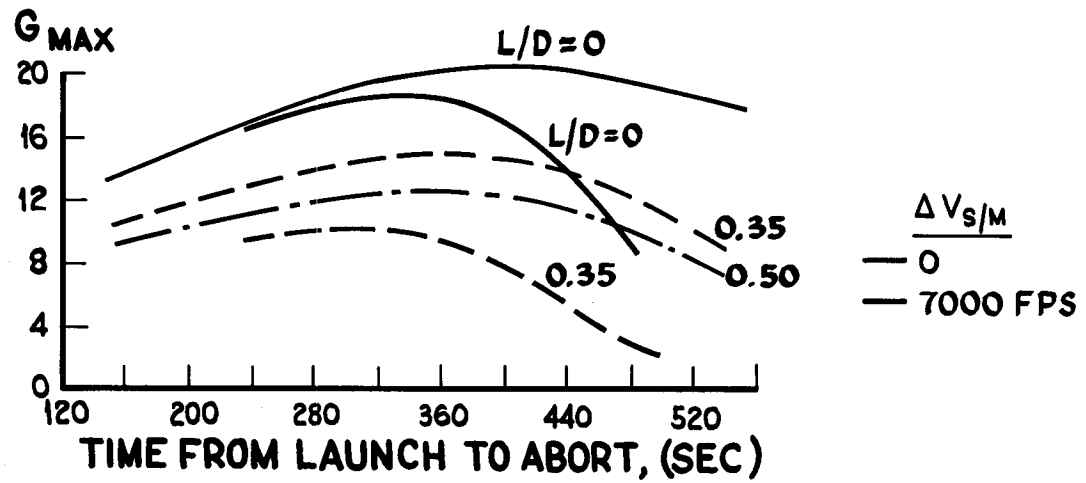
L/D

10-62 AP 19989

EXO-ATMOSPHERIC ABORT

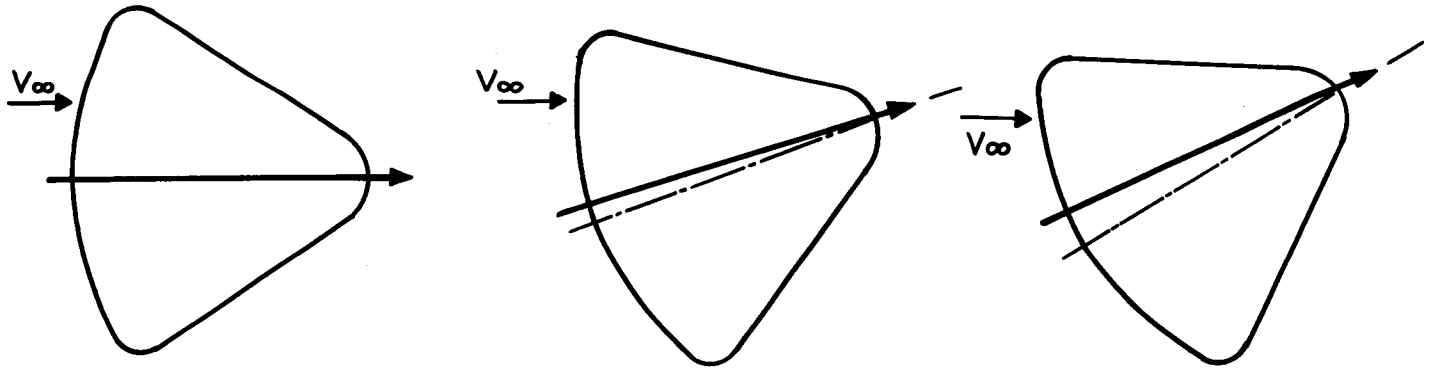
C-1 BOOST FOR 100 N MI ORBIT





10-62 AP22006

COMMAND MODULE AERODYNAMICS



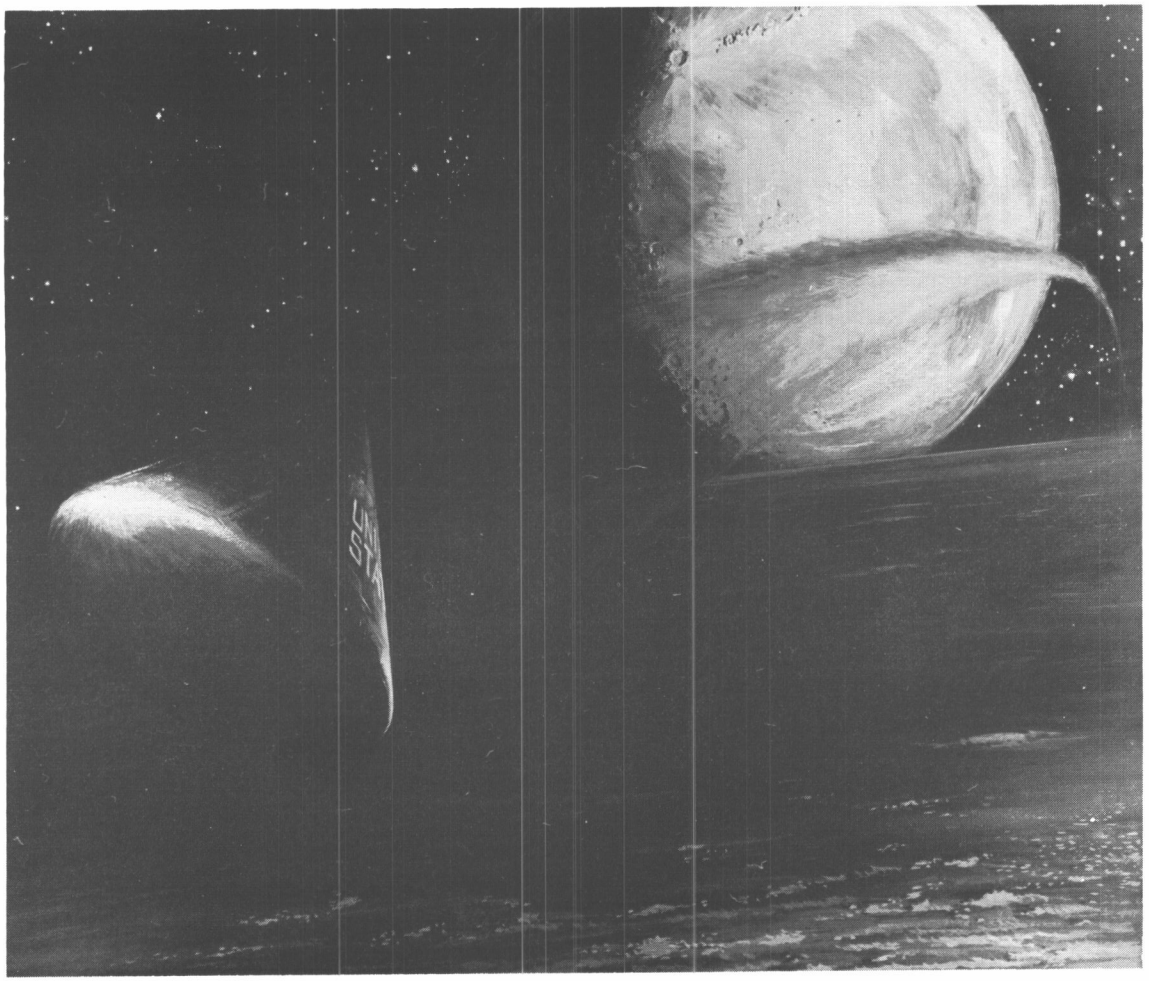
$\alpha = 180°$
L/D = 0

$\alpha = 160°$
L/D = 0.3

$\alpha = 147°$
L/D = 0.5

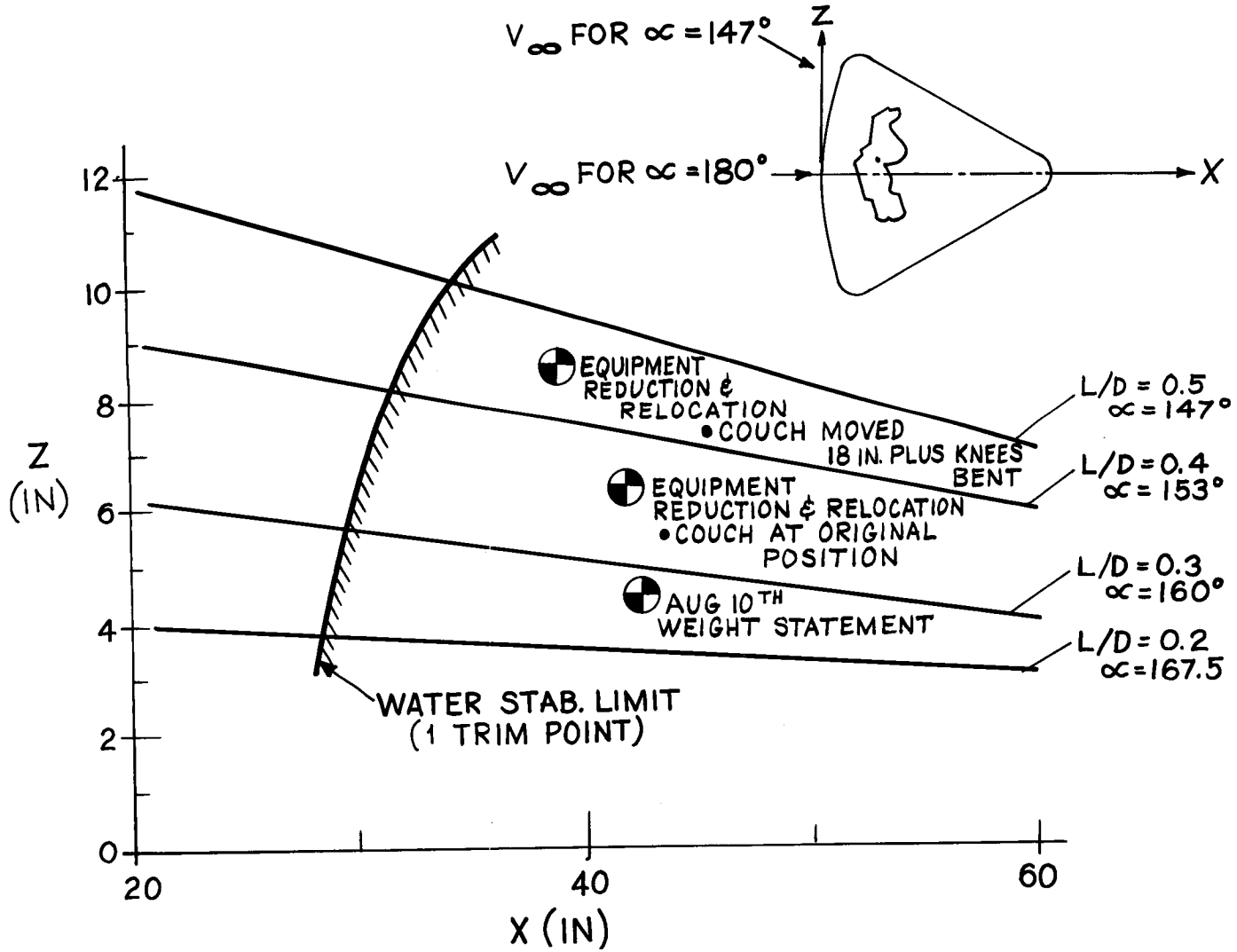
10-62 AP22004

NORMAL ENTRY



10-62 AP 22160

EFFECT OF CG POSITION ON ENTRY L/D

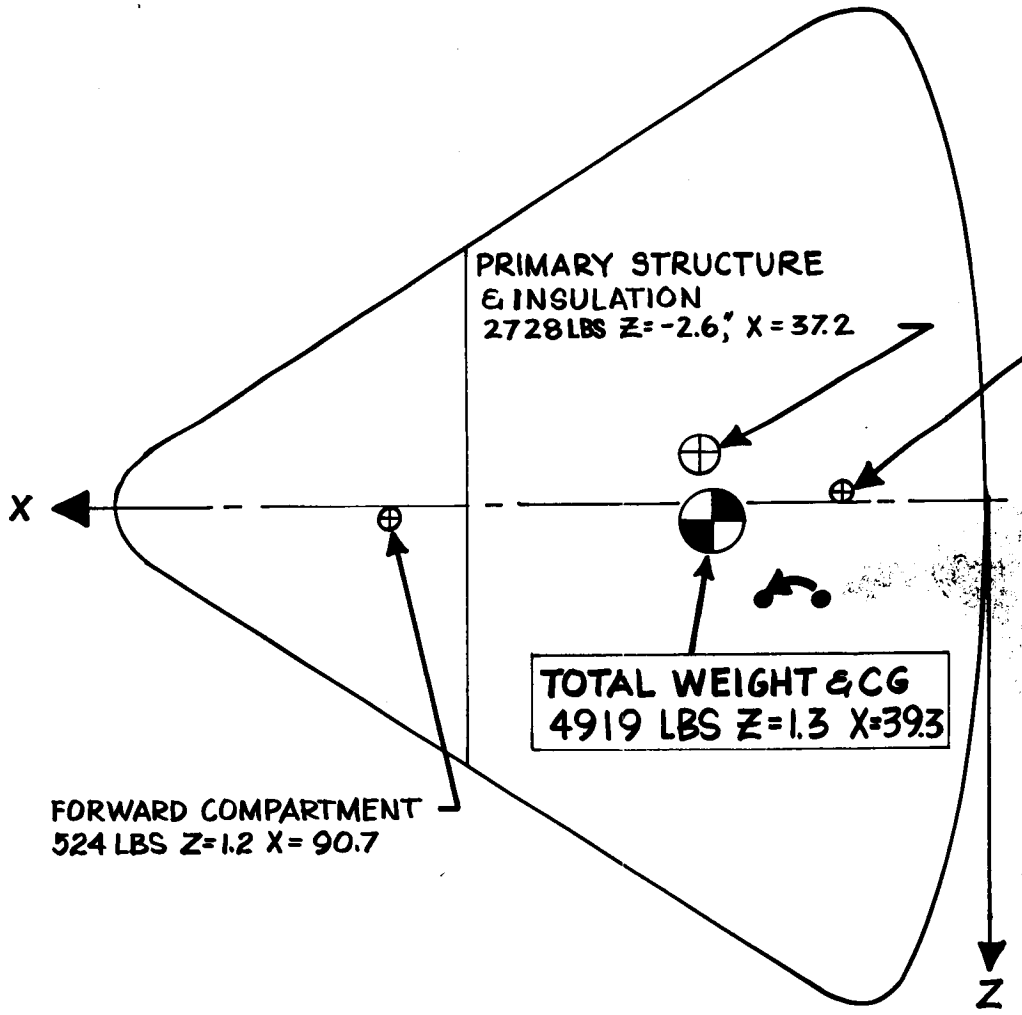


10-62 AP22128

CG

10-62 AP 19988

STRUCTURE & FIXED EQUIPMENT

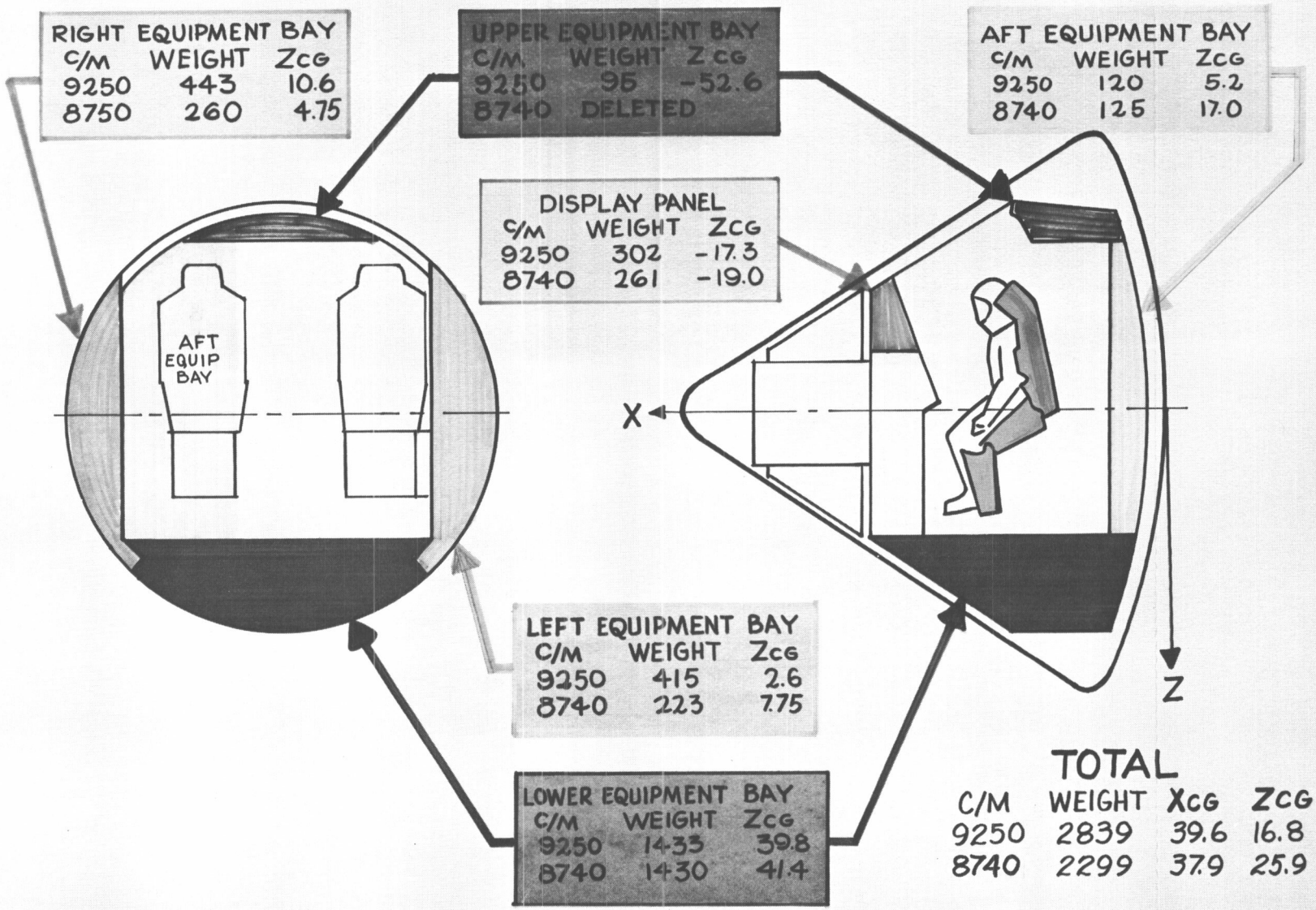

PRIMARY STRUCTURE
& INSULATION
2728 LBS Z = -2.6", X = 37.2
AFT COMPARTMENT
563 LBS, Z = -2.7", X = 19.9
X
Z
TOTAL WEIGHT & CG
4919 LBS Z = 1.3 X = 39.3
FORWARD COMPARTMENT
524 LBS Z = 1.2 X = 90.7

ABLATION ● MATERIAL

TIME SEC	WT LBS	X IN	Z IN
0	1484	30.1	9.7
500	1295	31.9	9.2
1000	1215	32.5	9.1
1500	1180	32.7	9.1
2000	1170	32.9	9.3

10-62 AP22135A

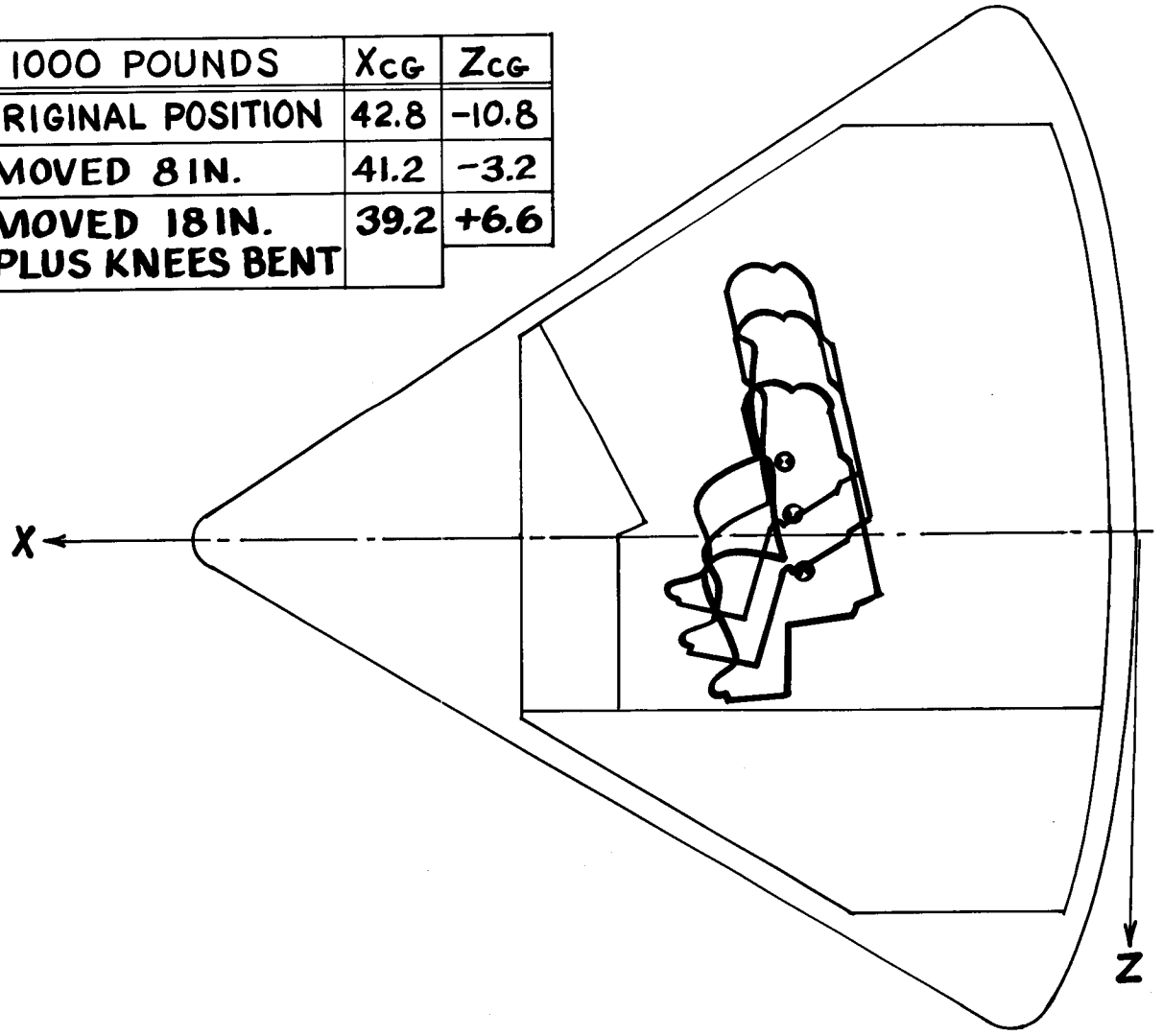
EQUIPMENT REDUCTION & RELOCATION



10-62 AP 22134-A

THREE COUCH POSITIONS

1000 POUNDS	X_{CG}	Z_{CG}
ORIGINAL POSITION	42.8	-10.8
MOVED 8 IN.	41.2	-3.2
MOVED 18 IN. PLUS KNEES BENT	39.2	+6.6



10-62 AP22130

APOLLO COMMAND MODULE 8740-LB CONFIGURATION

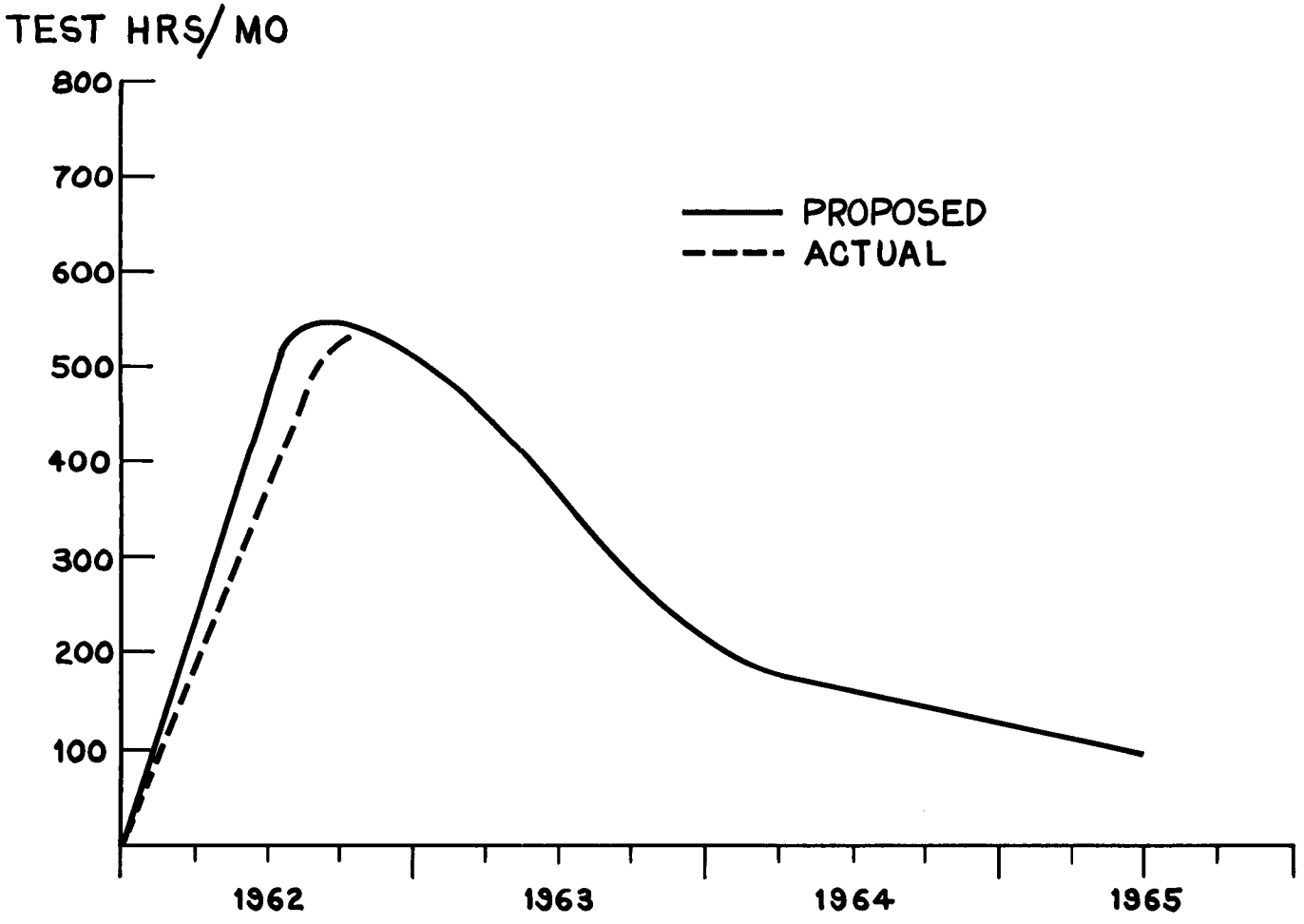
AREA	WEIGHT	Z_{CG} IN.	M_Z (IN-LB)	X_{CG} IN.	M_X (IN-LB)
STRUCTURE AND FIXED EQUIPMENT	4919	1.3	6,611	39.3	193,400
EQUIPMENT RELOCATION	2299	25.9	59,534	37.9	87,125
THREE COUCH POSITIONS	1000	0.0	660	39.2	39,200
SECONDARY STRUCTURE, WIRING & CONTROLS	522	2.2	1,166	40.2	20,962
TOTAL	8,740	7.7	67,311	38.9	340,687

10-62 AP22133A

AERODYNAMIC TESTING

10-62 AP 19987

WIND TUNNEL TEST HOURS

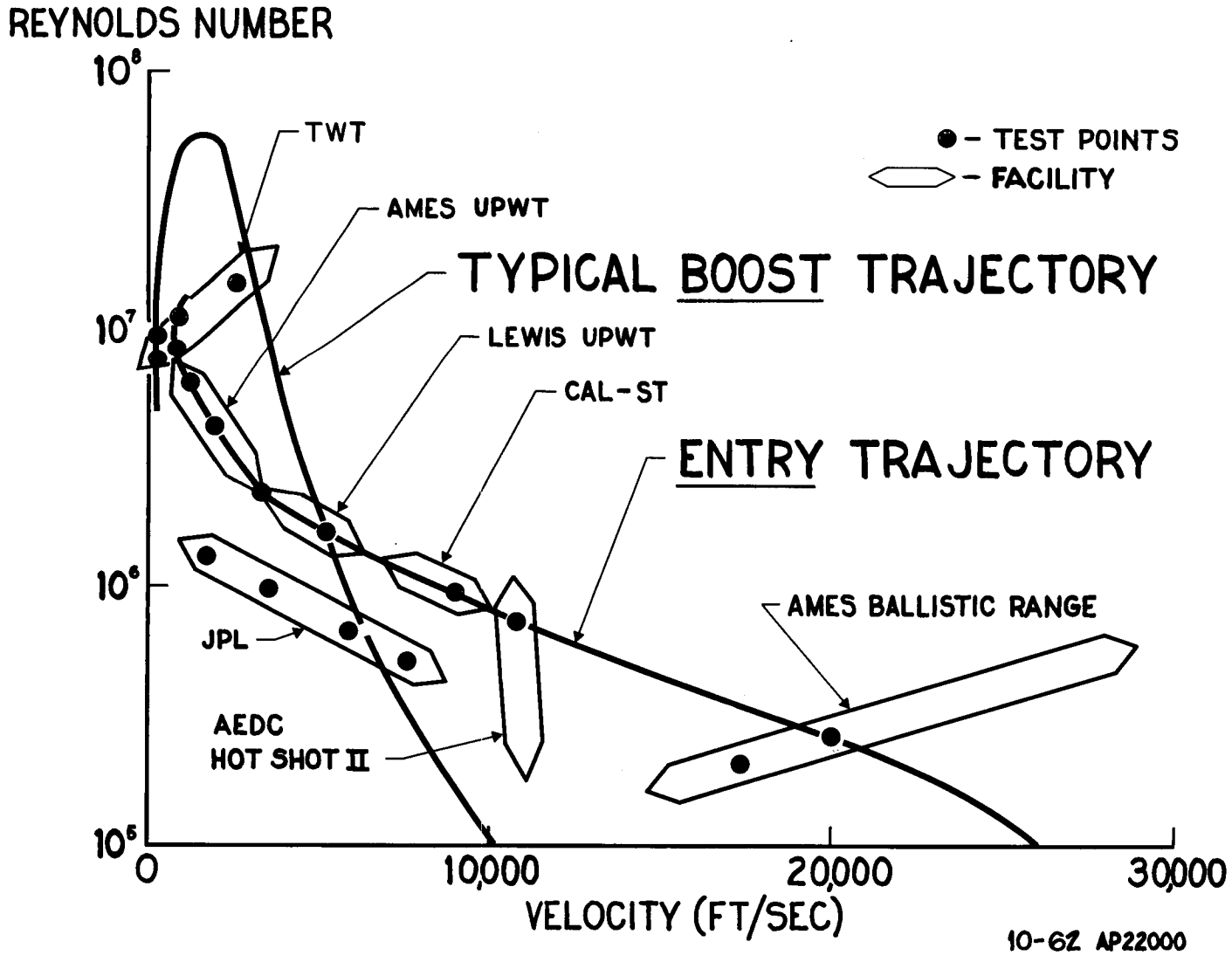


10-62 AP22002

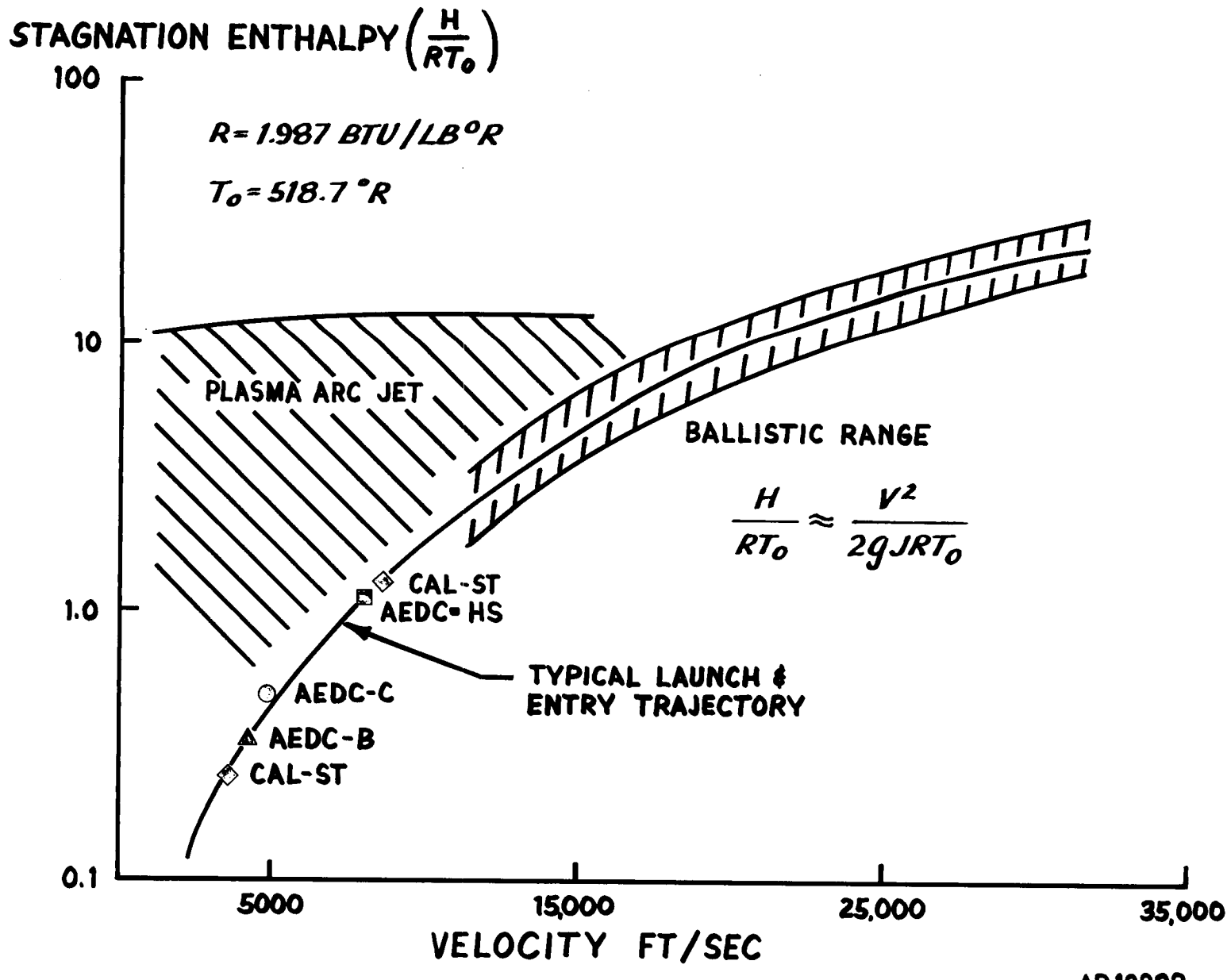
TEST FACILITIES

LABORATORY	NO. OF FACILITIES	PLANNED THRU MAY 1965		ACCOMPLISHMENTS THRU SEP 1962	
		TESTS	HOURS	TESTS	HOURS
NASA - AMES	6	58	2980	16	947
NASA - LANGLEY	6	26	1310	4	163
NASA - LEWIS	2	2	170	0	0
NASA - JPL	2	9	370	9	300
USAF - AEDC	5	61	2500	10	432
U. S. ARMY BAL	1	6	310	0	0
CORNELL	2	14	620	2	80
NAA	4	31	1540	8	444
TOTAL	28	207	9800	49	2366

AERODYNAMIC SIMULATION

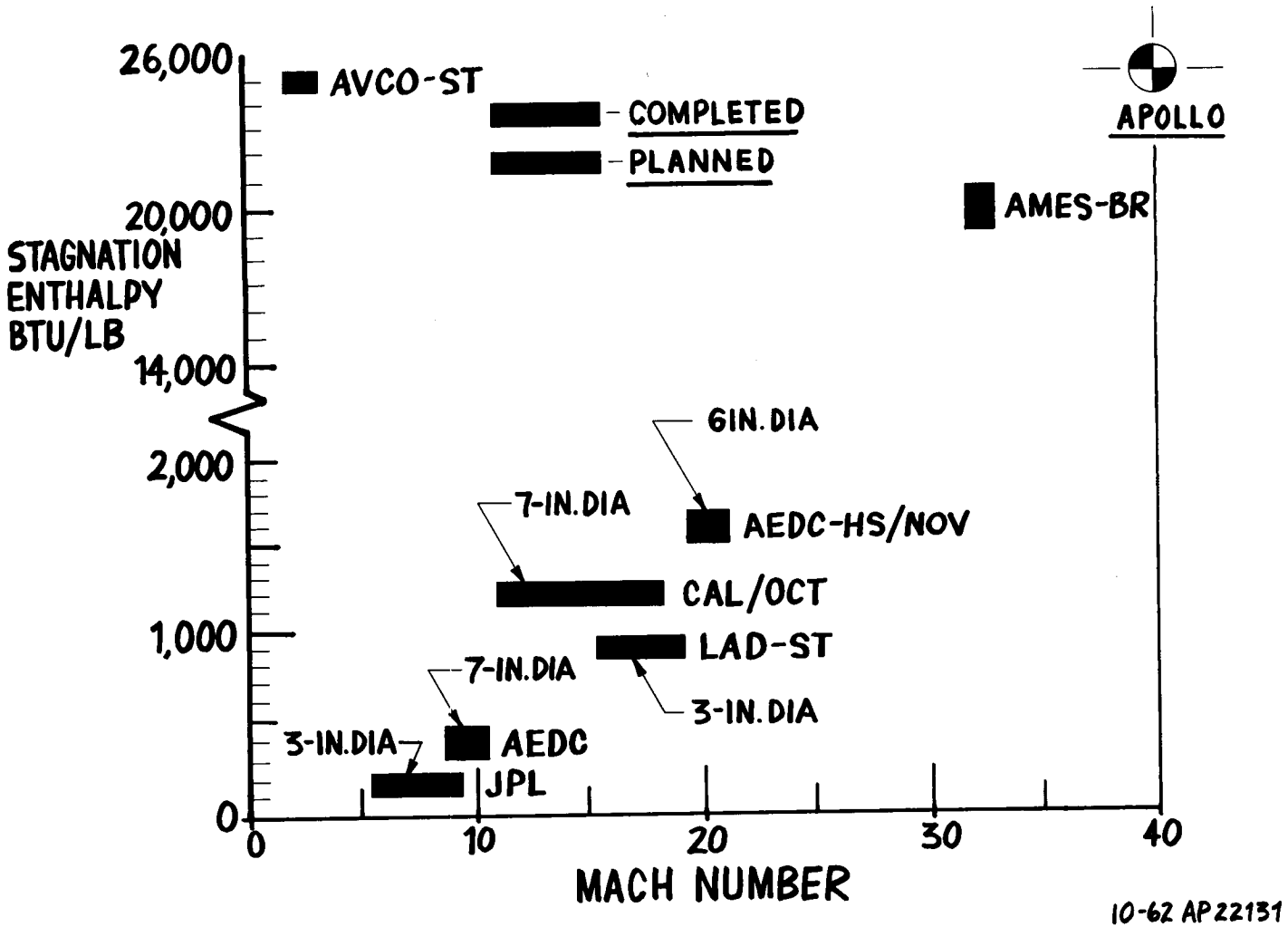


AERO/THERMO SIMULATION



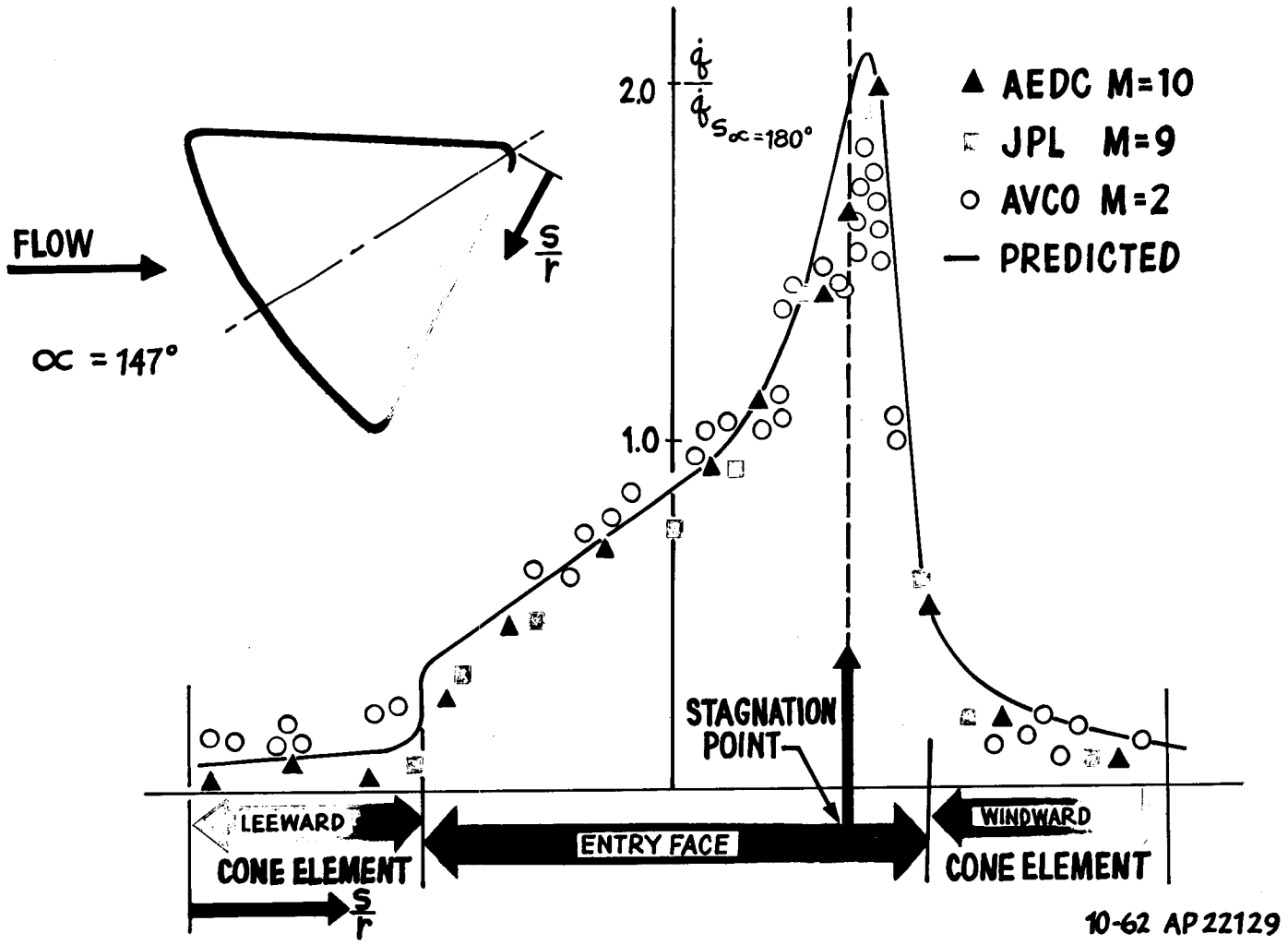
AP 19999

AERO HEATING
WIND TUNNEL PROGRAM

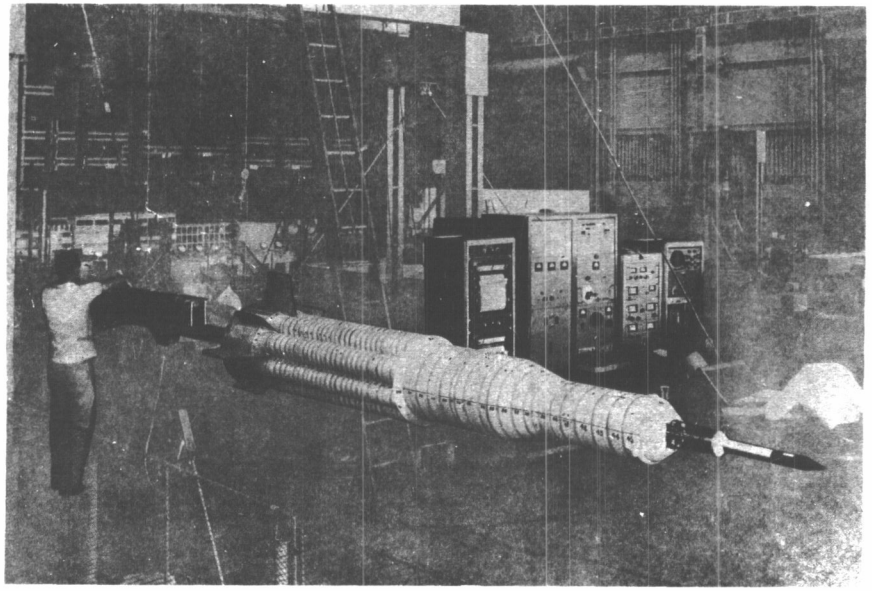


10-62 AP22131

COMPARISON OF AERO HEATING TESTS



STRUCTURAL DYNAMICS MODEL



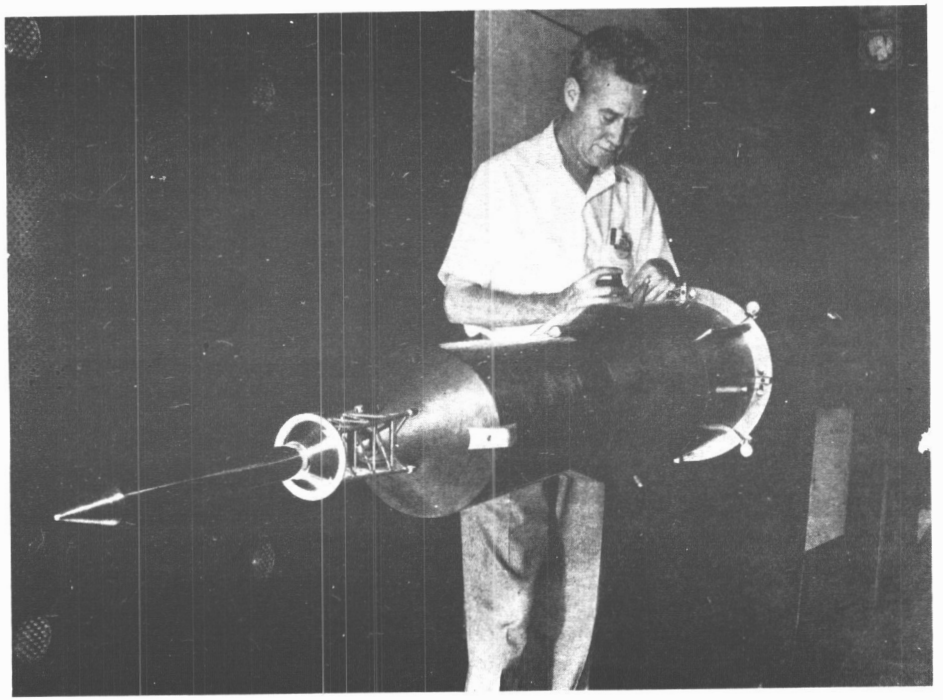
WEIGHT - 830 LBS

LENGTH - 177 INCHES

- MSFC C-1
- 0.080 SCALE
- TWO BENDING FREQUENCIES
- NODAL SUPPORT
- FREE TO PITCH
- LRC 16-FT TRANSONIC DYNAMIC TUNNEL
- AEROELASTIC RESPONSE

10-62 AP 19998

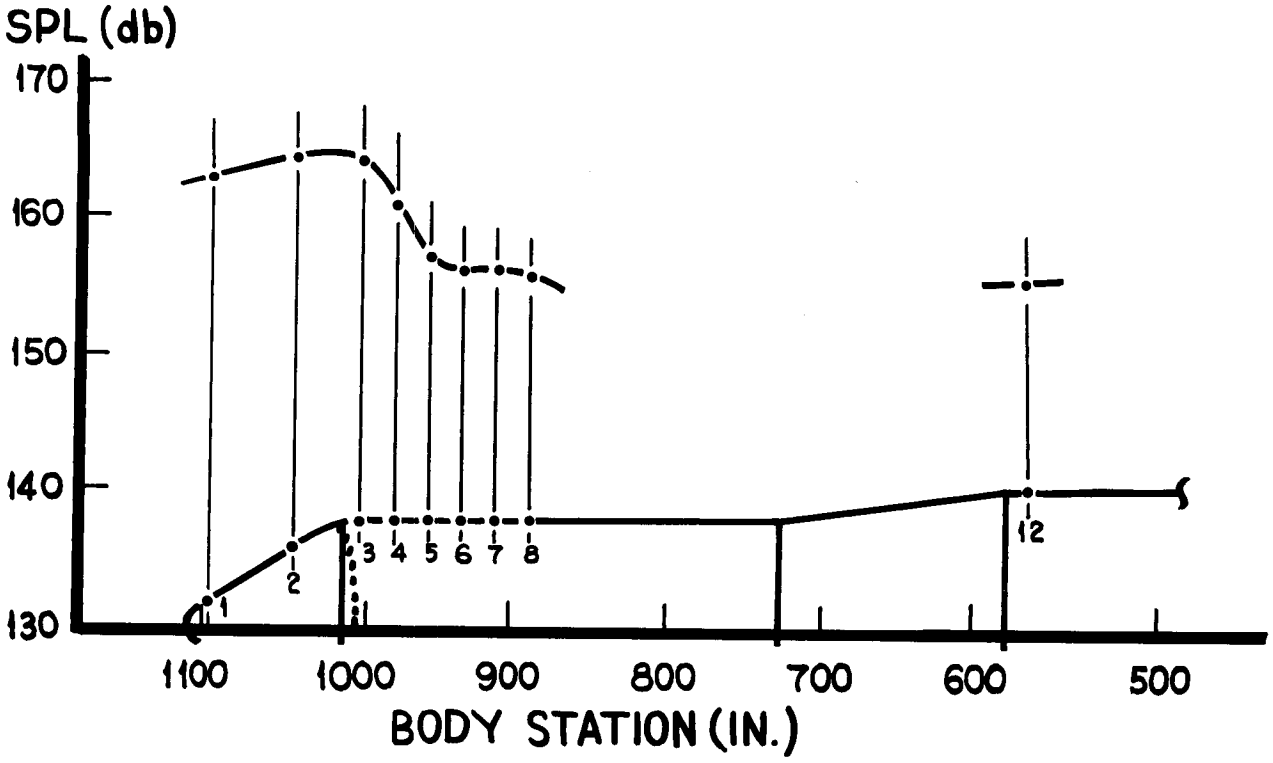
TRANSIENT PRESSURE MODEL



- BUFFET PRESSURES
- AERODYNAMIC NOISE
- STEADY-STATE AIR LOADS

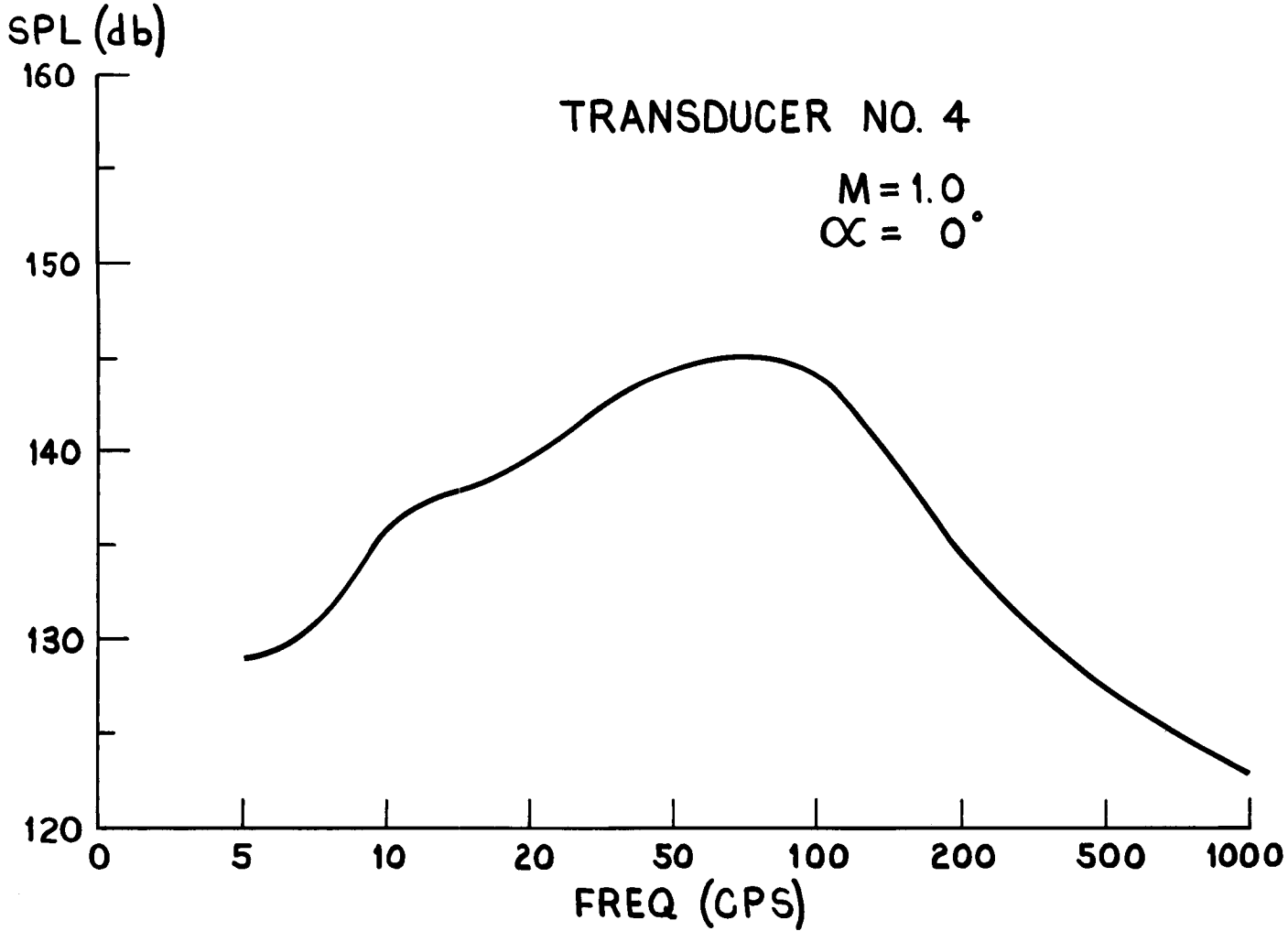
FLUCTUATING PRESSURE TESTS

MAX OVERALL SOUND PRESSURE LEVELS FOR ALL SPEEDS & ∝'S TESTED



10-62 AP19994

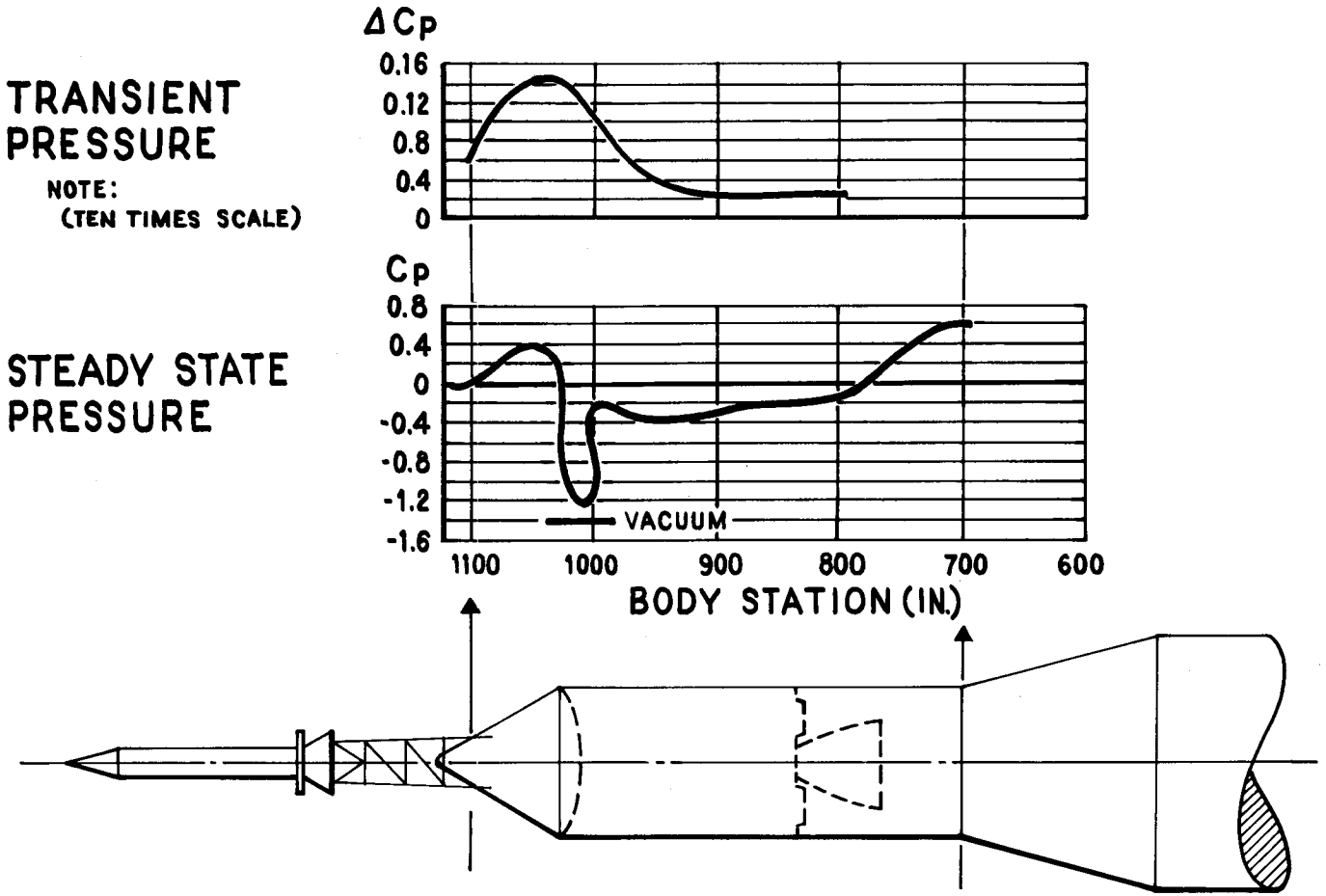
TYPICAL SPECTRUM



10-62 AP19996

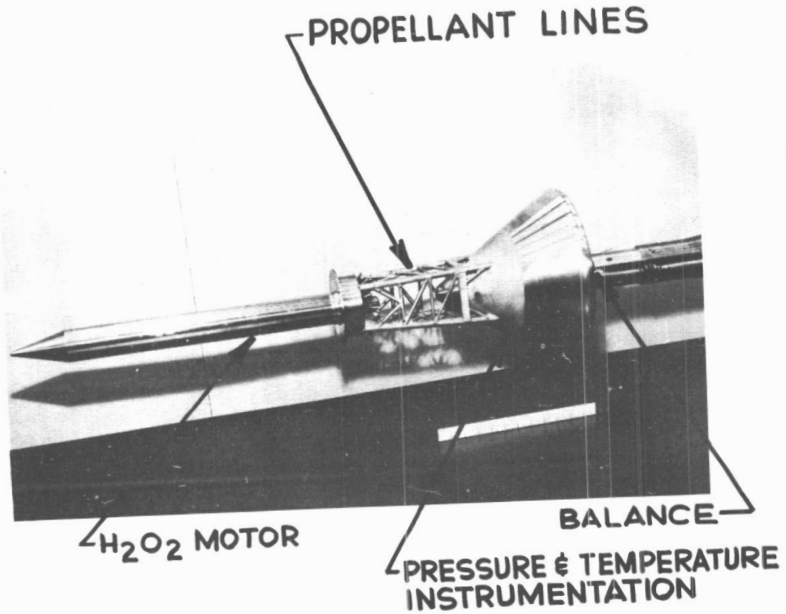
TRANSIENT PRESSURE RESULTS

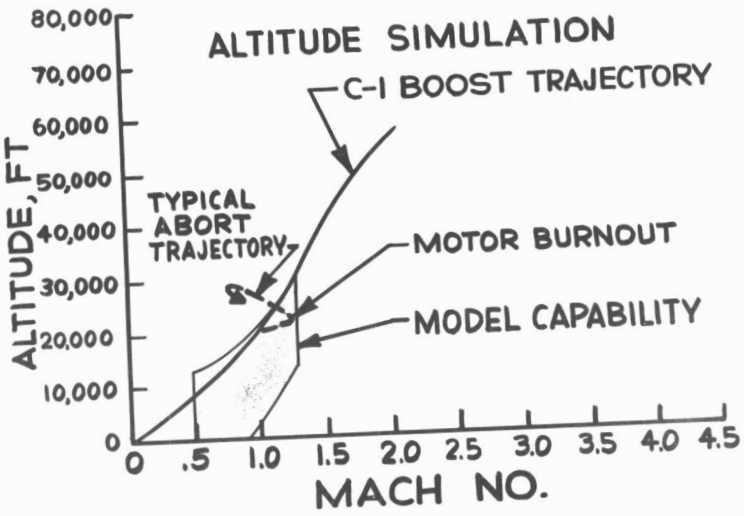
M = 1.0 $\alpha = 0°$

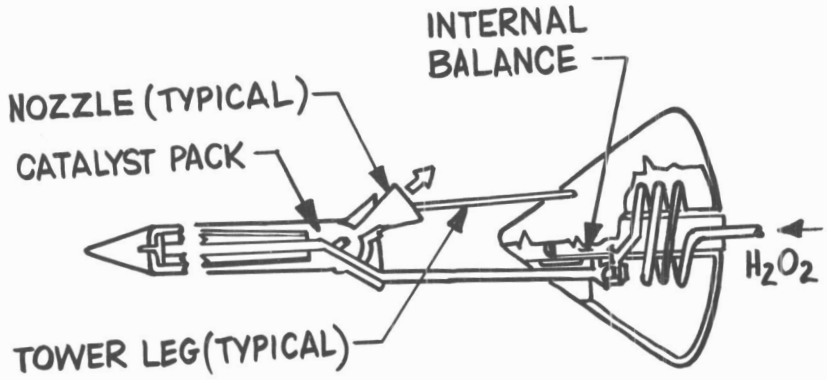


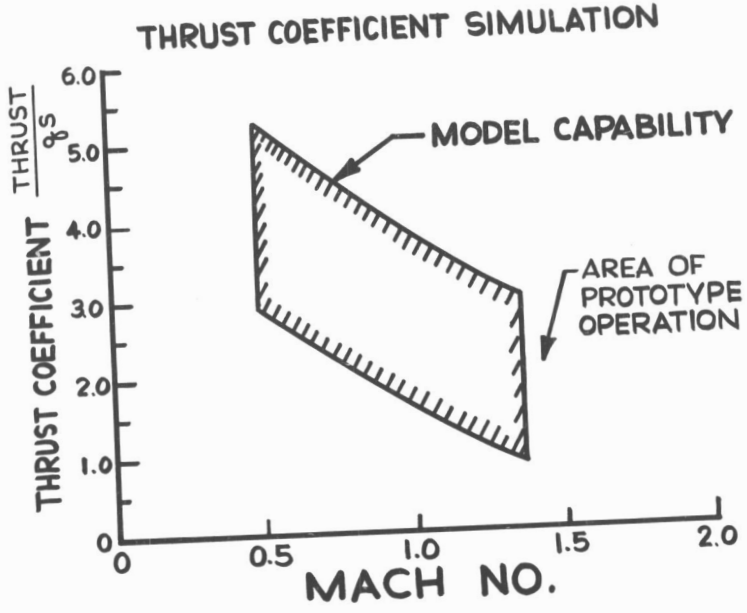
10-62 AP19995

JET EFFECTS MODEL









10-62 AP 22137

DESIGN

10-62 AP 22055

STATUS SUMMARY

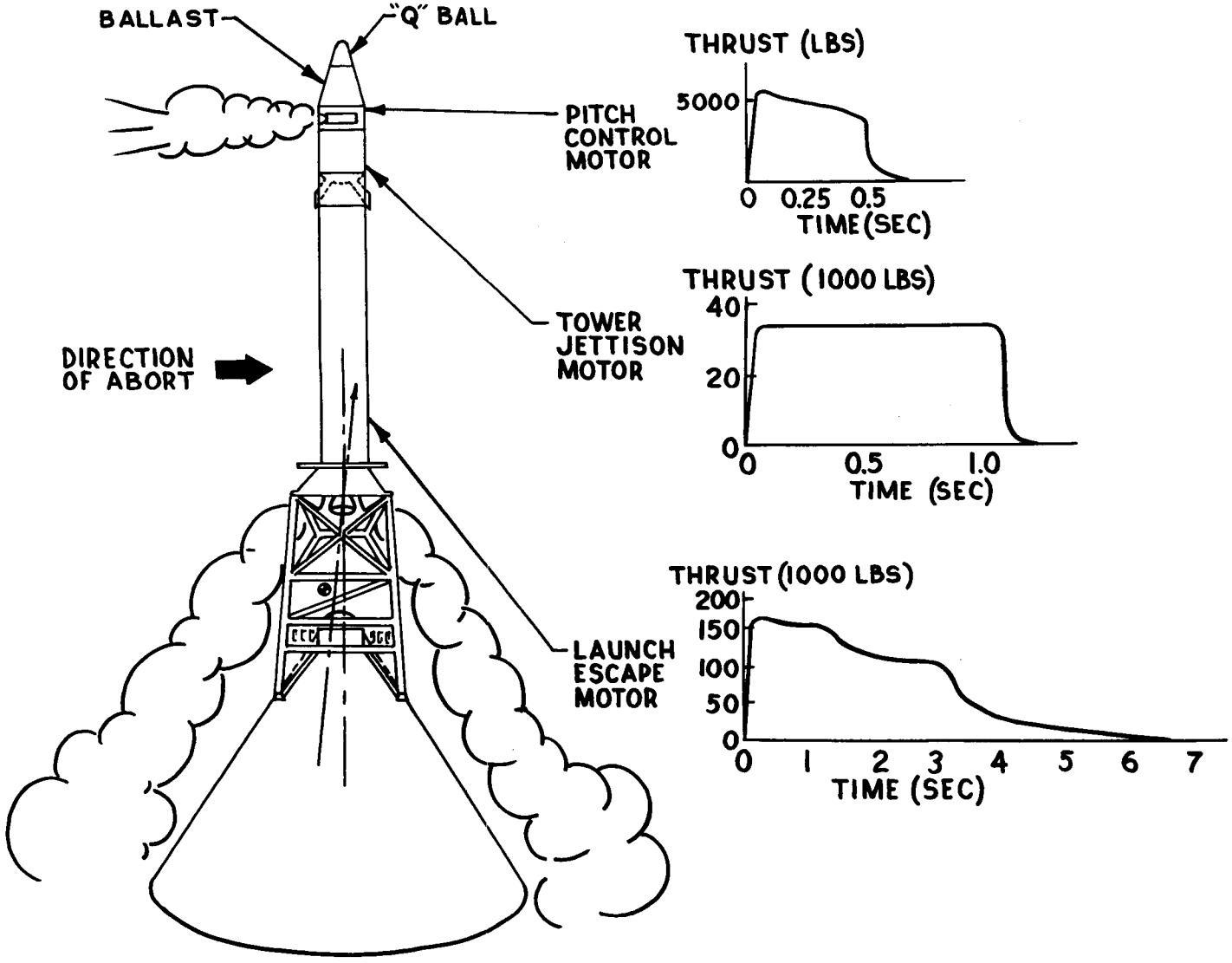
- LAUNCH ESCAPE
- S/M PROPULSION
- REACTION CONTROL ENGINES
- ELECTRICAL POWER
- ENVIRONMENTAL CONTROL
- COMMUNICATIONS
- STABILIZATION & CONTROL
- HEAT SHIELD
- RECOVERY
- SPACE ENVIRONMENT TEMPS

10-62 AP 22153

LAUNCH ESCAPE SYSTEM

10-62 AP22056

LES CONFIGURATION



10-62 AP 22059A

LAUNCH ESCAPE & PITCH CONTROL MOTORS - LOCKHEED

MILESTONE SCHEDULE

REDIRECTION, FIXED NOZZLES

GRAIN REDESIGN COMPLETE

AFT HEAD REDESIGN COMPLETE

NOZZLE REDESIGN COMPLETE

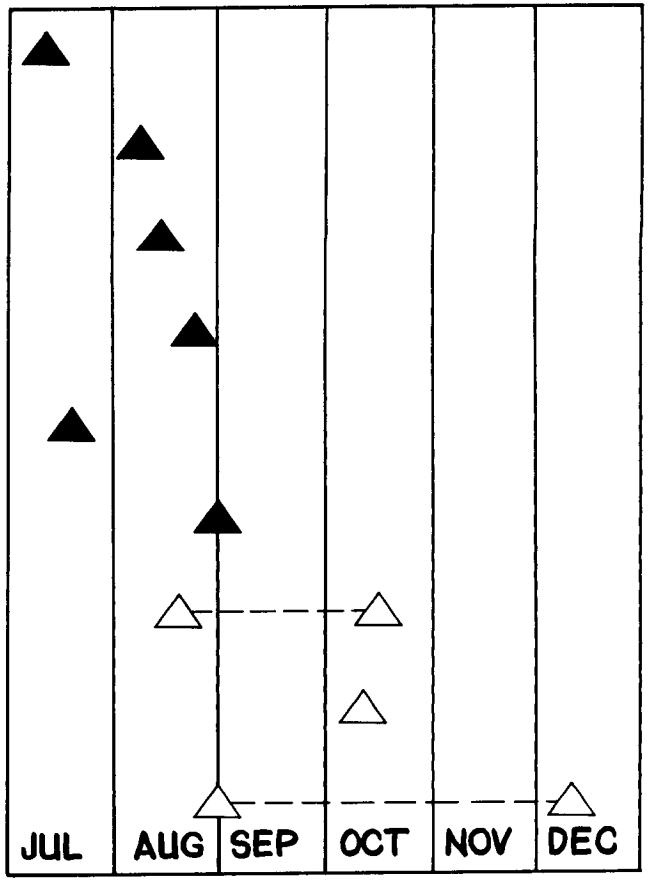
PITCH CONTROL MOTOR AWARD

PCM DESIGN COMPLETE

START IGNITER TESTS

DELIVER FIRST INERT MOTORS (B/P-9)

FIRST STATIC FIRINGS



10-62 AP22058

TOWER JETTISON MOTOR-THIOKOL
MILESTONE SCHEDULE

INTERSTAGE ORDERS PLACED

NOZZLES RECEIVED

CASES RECEIVED

DELIVER INERT MOTOR (B/P-9)

INITIAL IGNITER TESTS (HOT WIRE)

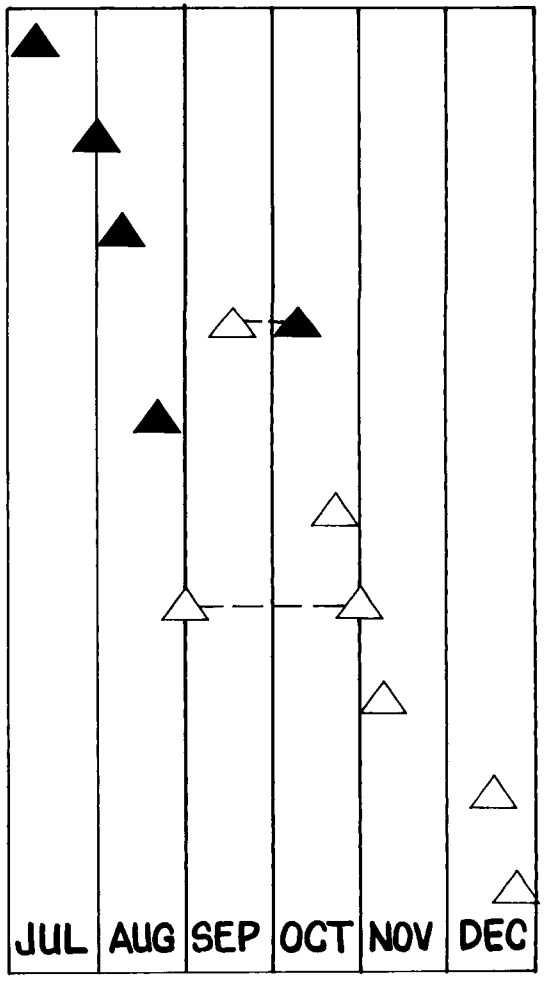
EBW IGNITER TESTS START

FIRST STATIC FIRING

START ACCELERATED AGING TEST

FIRST FIVE DEVELOPMENT TESTS COMPLETE

SHIP TWO MOTORS TO AEDC FOR ALTITUDE TESTS



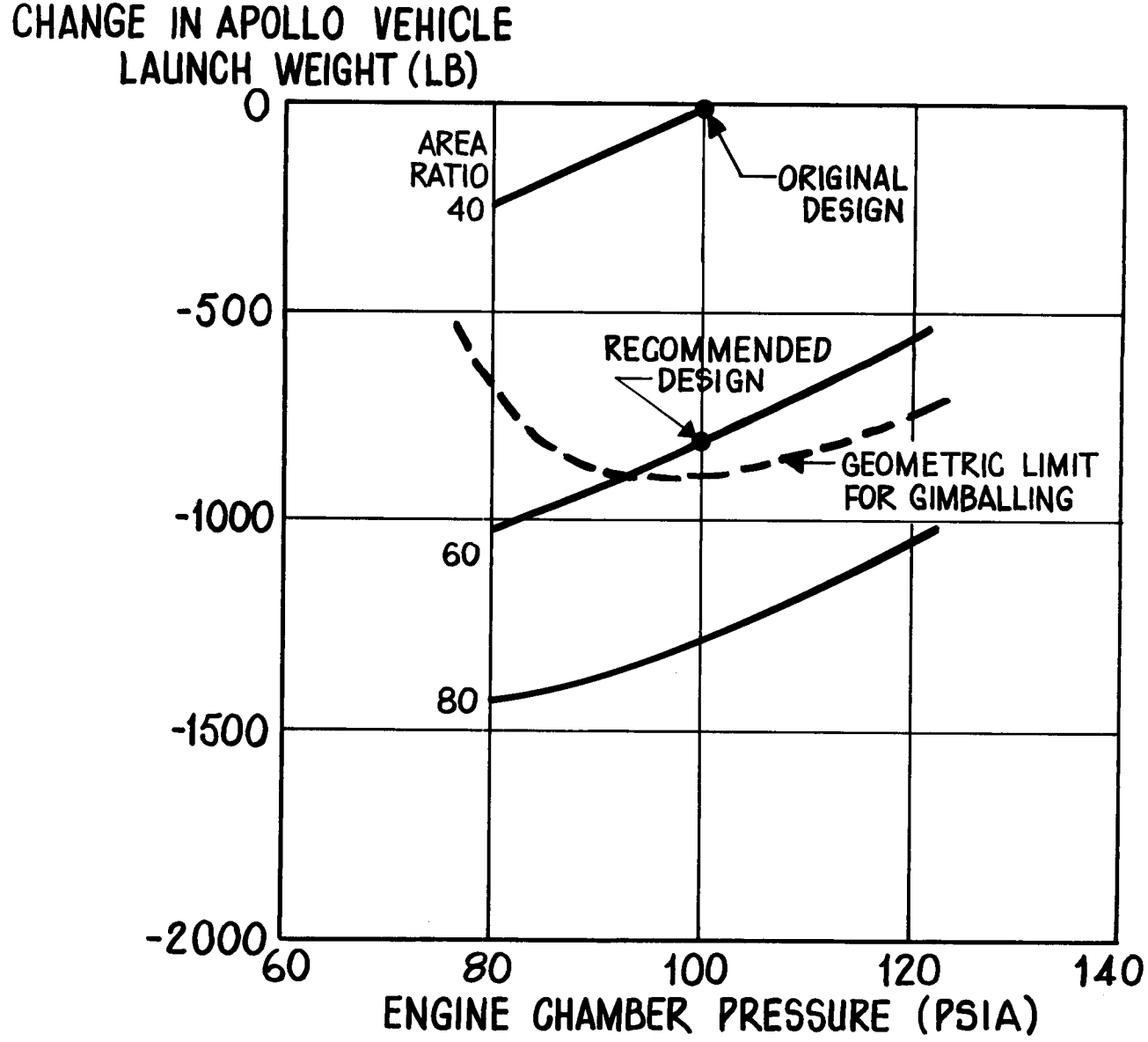
1962

10-62 AP 22057

SERVICE PROPULSION ENGINE

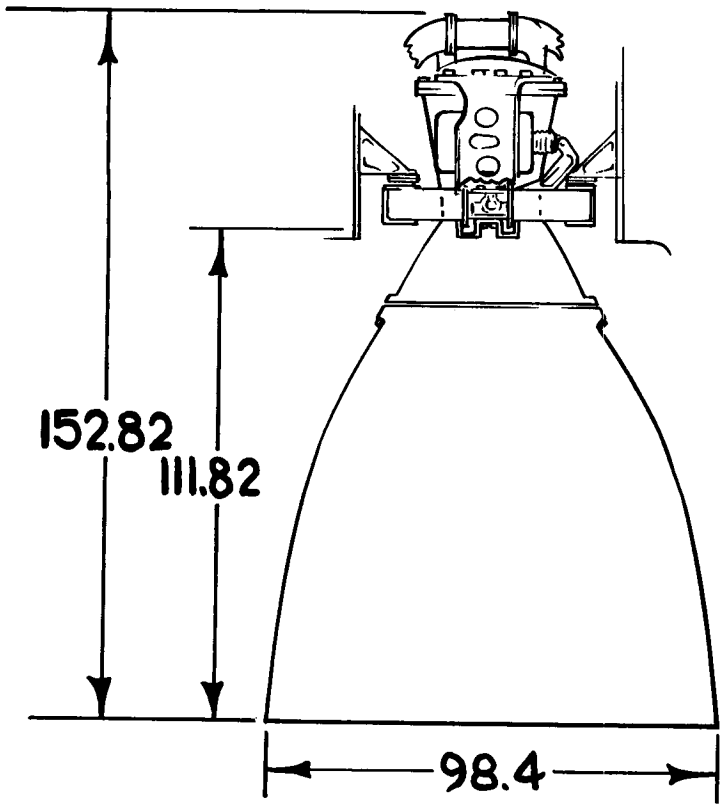
10-62 AP 22060

SERVICE PROPULSION ENGINE OPTIMIZATION



10-62 AP22061

SERVICE PROPULSION ENGINE CONFIGURATION



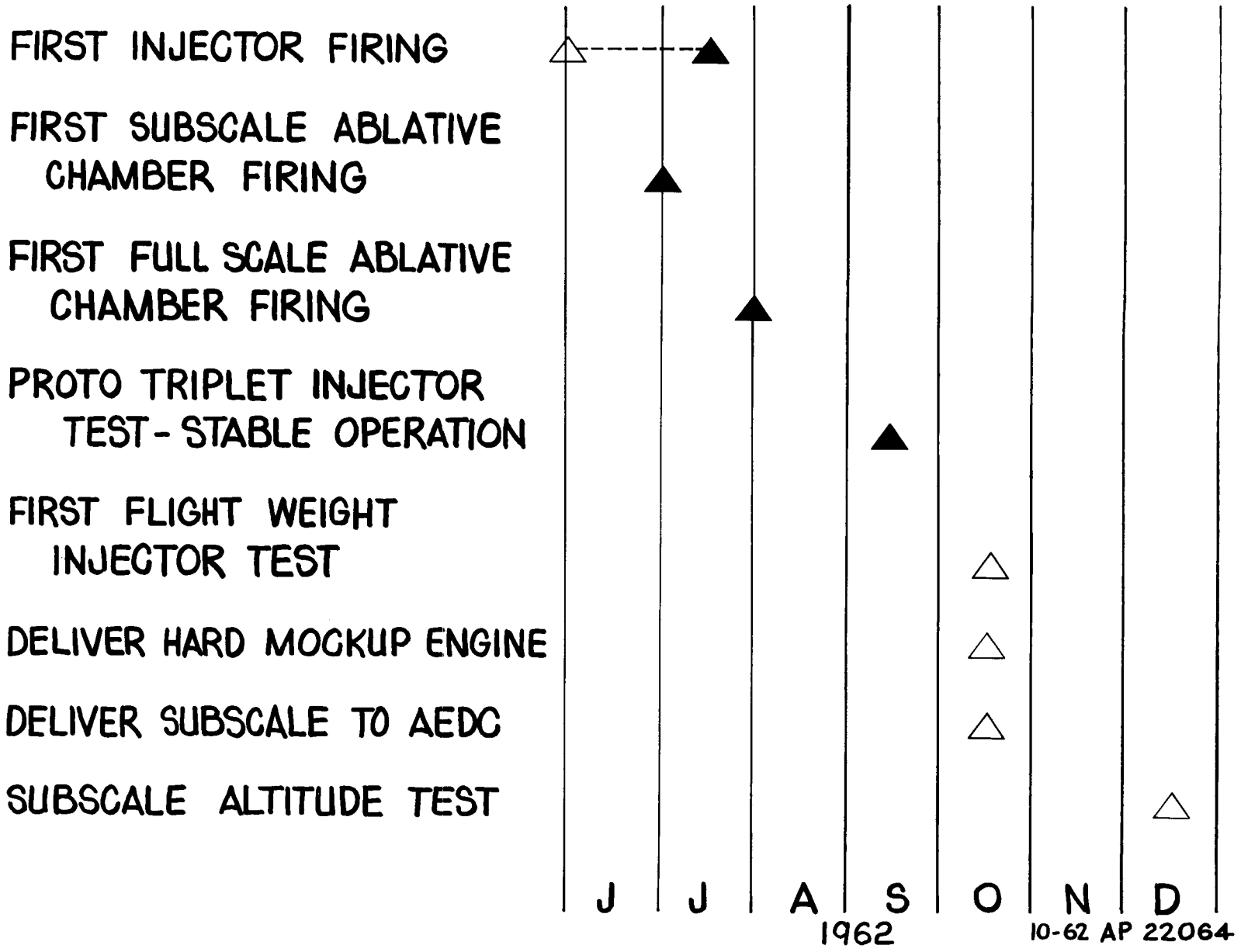
PERFORMANCE CHARACTERISTICS

THRUST, NOMINAL (LB)	21,900
I_{SP}, MINIMUM (SEC) (3σ AT 750 SEC)	318.7
AREA RATIO	60:1
PROPELLANTS N_2O_4/AEROZINE	50
MIXTURE RATIO, NOMINAL	2.0
CHAMBER PRESSURE (PSIA)	100
DRY WEIGHT (LBS)	582
NUMBER OF RESTARTS	50

10-62 AP22062

SERVICE PROPULSION ENGINE - AEROJET

MILESTONES

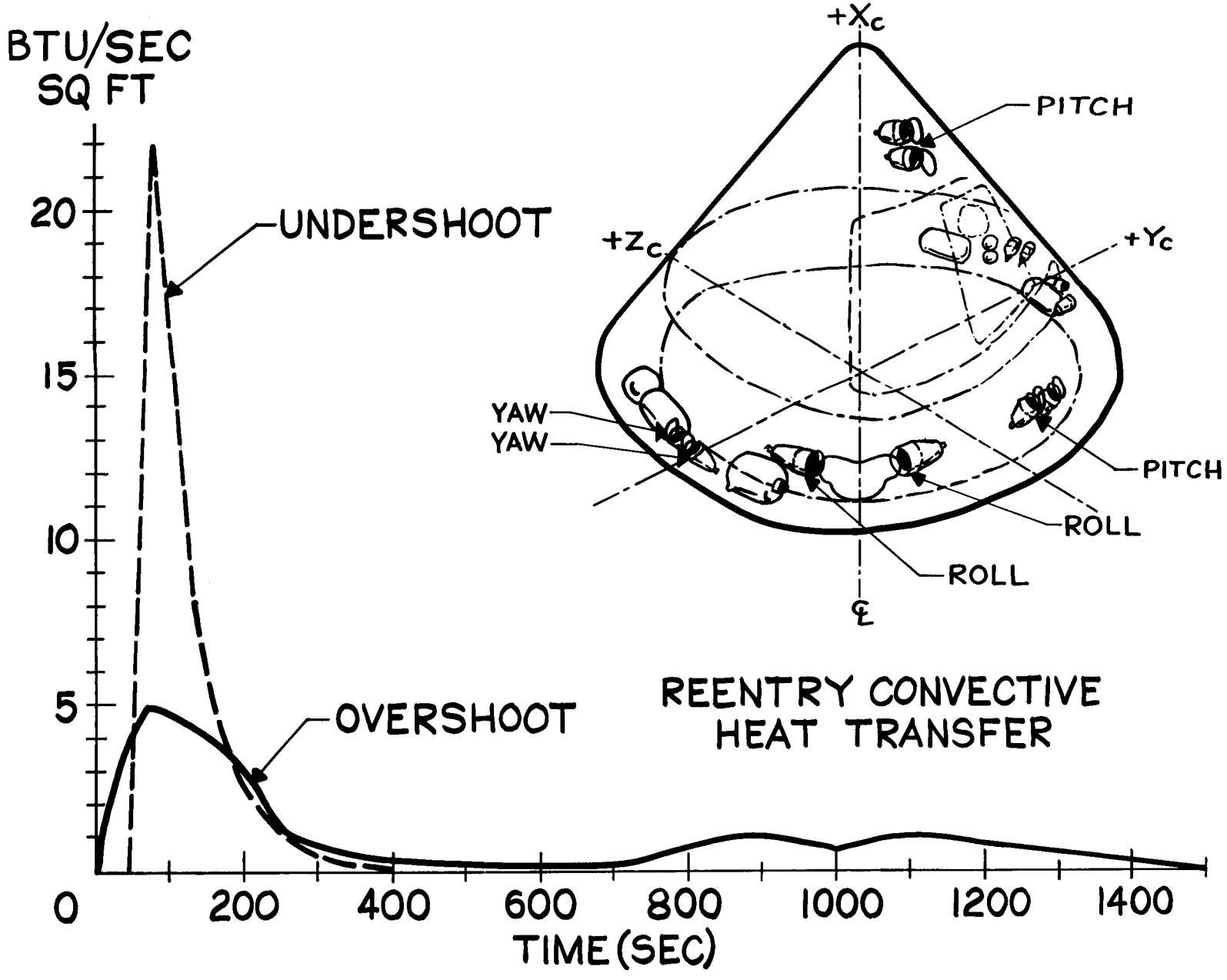


10-62 AP 22064

REACTION CONTROL SYSTEM

10-62 AP 22065

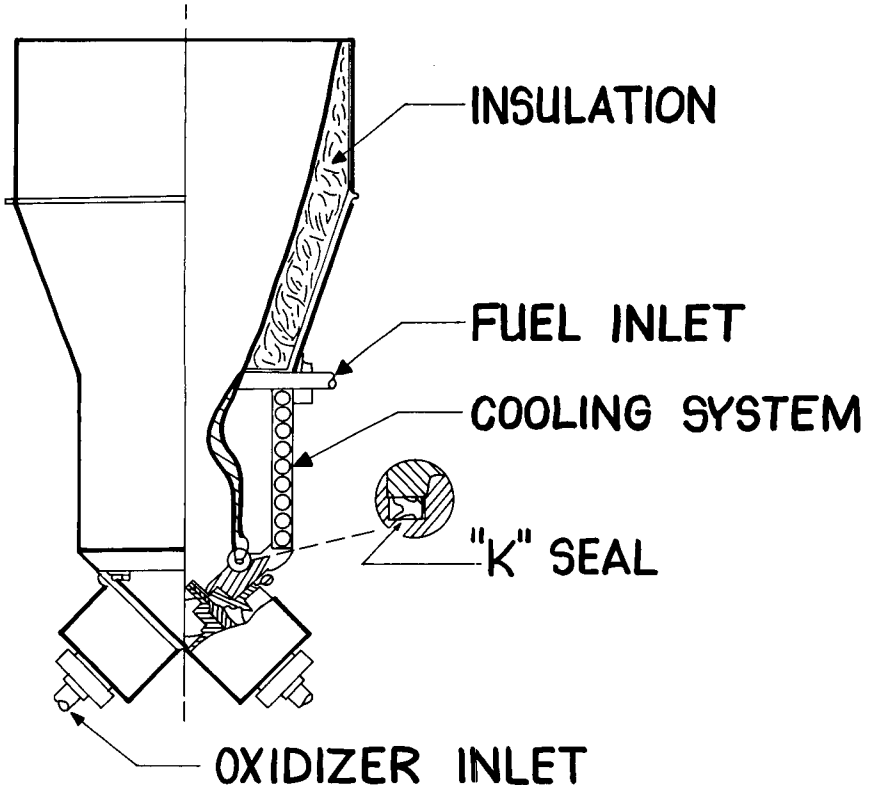
C/M RCS ENTRY HEATING PROBLEM



10-62 AP22066

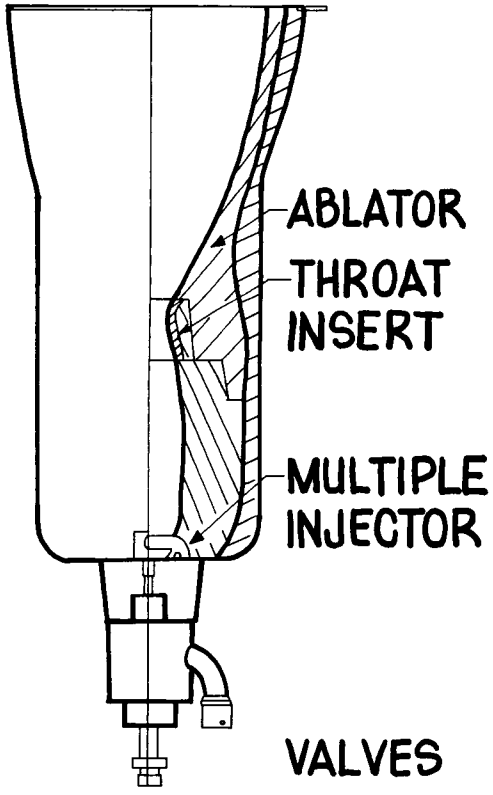
C/M RCS ENGINE CONFIGURATION

ORIGINAL APOLLO



PROPELLANT: N_2O_4 & AEROZINE 50
THRUST: 100 LBS
MIN IMPULSE: 1.0 LB SEC
CHAMBER PRESSURE: 100 PSIA
SUPPLY PRESSURE: 170 PSIA
DRY WEIGHT: 5.5 LBS

GEMINI



PROPELLANT: N_2O_4 & MMH
THRUST: 100 LBS
MIN IMPULSE: 2.0 LBS SEC
CHAMBER PRESSURE: 150 PSIA
SUPPLY PRESSURE: 280 PSIA
WEIGHT: 9.0 LBS

10-62 AP 22067

C/M RCS ENGINE - ROCKETDYNE
MILESTONES

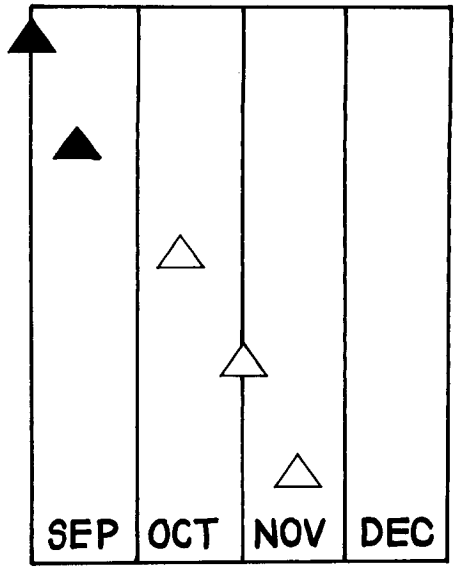
TECHNICAL APPROACH - USE GEMINI

PRELIMINARY SPECIFICATION

PROCUREMENT SPEC RELEASE

DELIVER NON-FIREABLE ENGINES

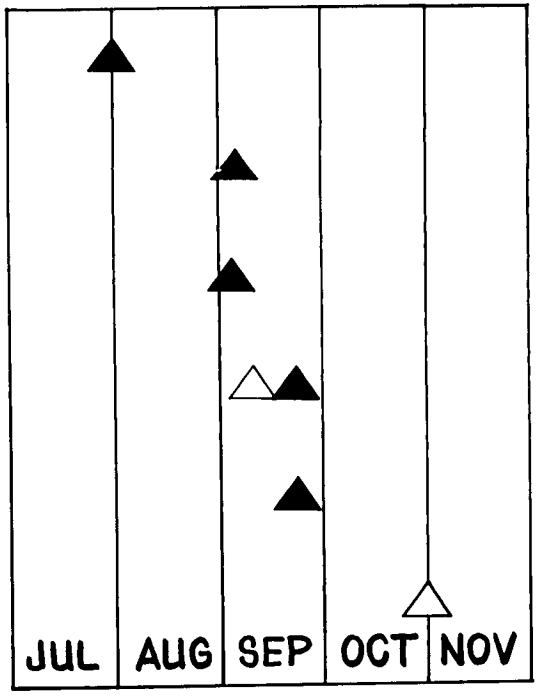
INITIATE TESTING



1962

S/M RCS - MARQUARDT
MILESTONE SCHEDULE

- INITIATE 8 ON 8 INJECTOR TESTING
- INITIATE ALTITUDE TESTING
- DEMONSTRATED 306 SEC I_{SP}
- PROTOTYPE DESIGN RELEASE
- DELIVERY OF HARD MOCKUP
- PROTOTYPE DELIVERY

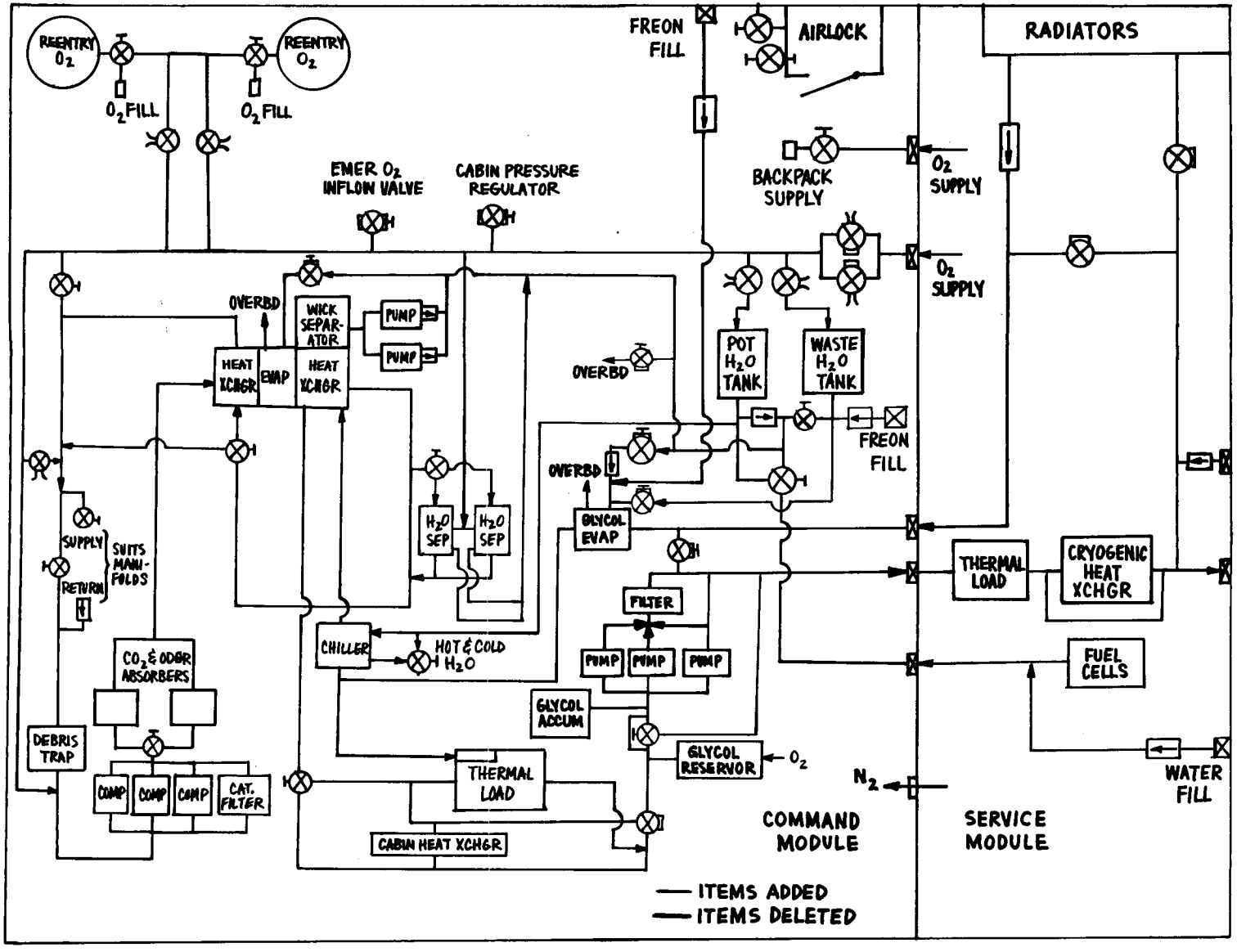


1962

ENVIRONMENTAL CONTROL SYSTEM

10-62 AP22070

ENVIRONMENTAL CONTROL SYSTEM



10-62 AP 22071

ECS - AIRESEARCH
MILESTONES

SUIT VENTILATION RATE TEST COMPLETE

CABIN RELIEF VALVE PROTO TEST START

H_2O SEPARATOR TEST START

O_2 DEMAND REG TEST START

COMPONENT EQUIP SPECS COMPLETE

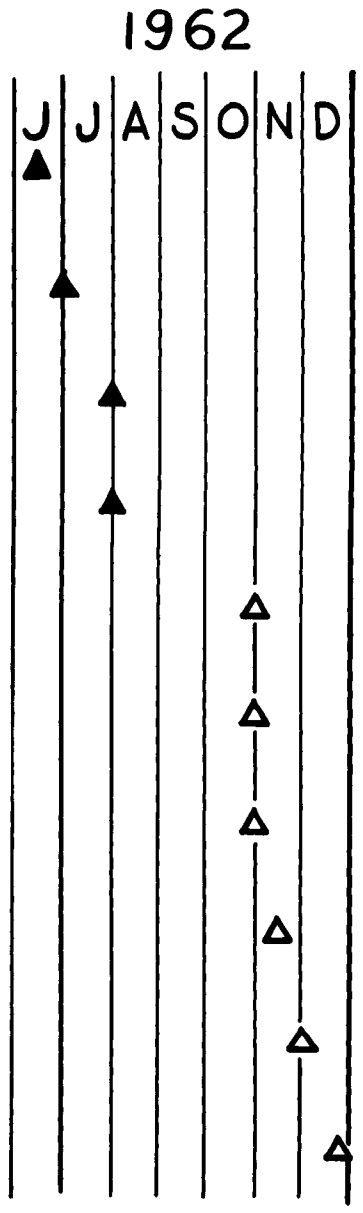
ECS - GSE PROTO SYS TEST START

ECS PROTO TEST START

H_2O SEPARATOR TEST COMPLETE

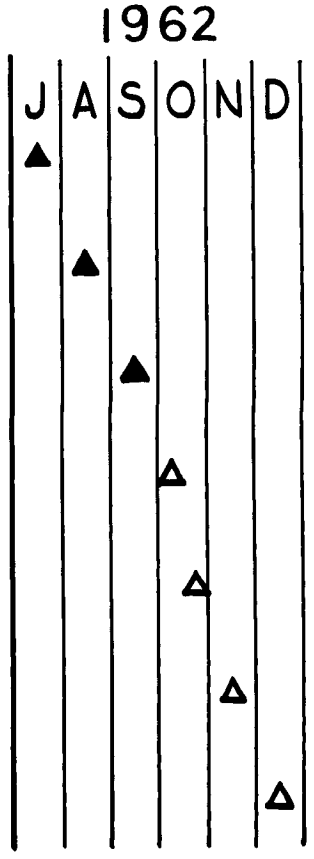
O_2 DEMAND REGULATOR TEST COMPLETE

DELIVER FIRST PROTOTYPE ECS - BB



10-62 AP 22118

CRYOGENIC GAS STORAGE SYSTEM - BEECH
MILESTONES



START DEVELOPMENT TESTS

PRESSURE VESSEL TOOLING COMPLETE

SUBCONTRACTED TEST FACILITIES

OUTER SHELL TOOLING COMPLETE

DESIGN RELEASE

START BREADBOARD TESTS

START ASSEMBLY - DEVELOPMENT TEST UNIT

ELECTRICAL POWER SYSTEM

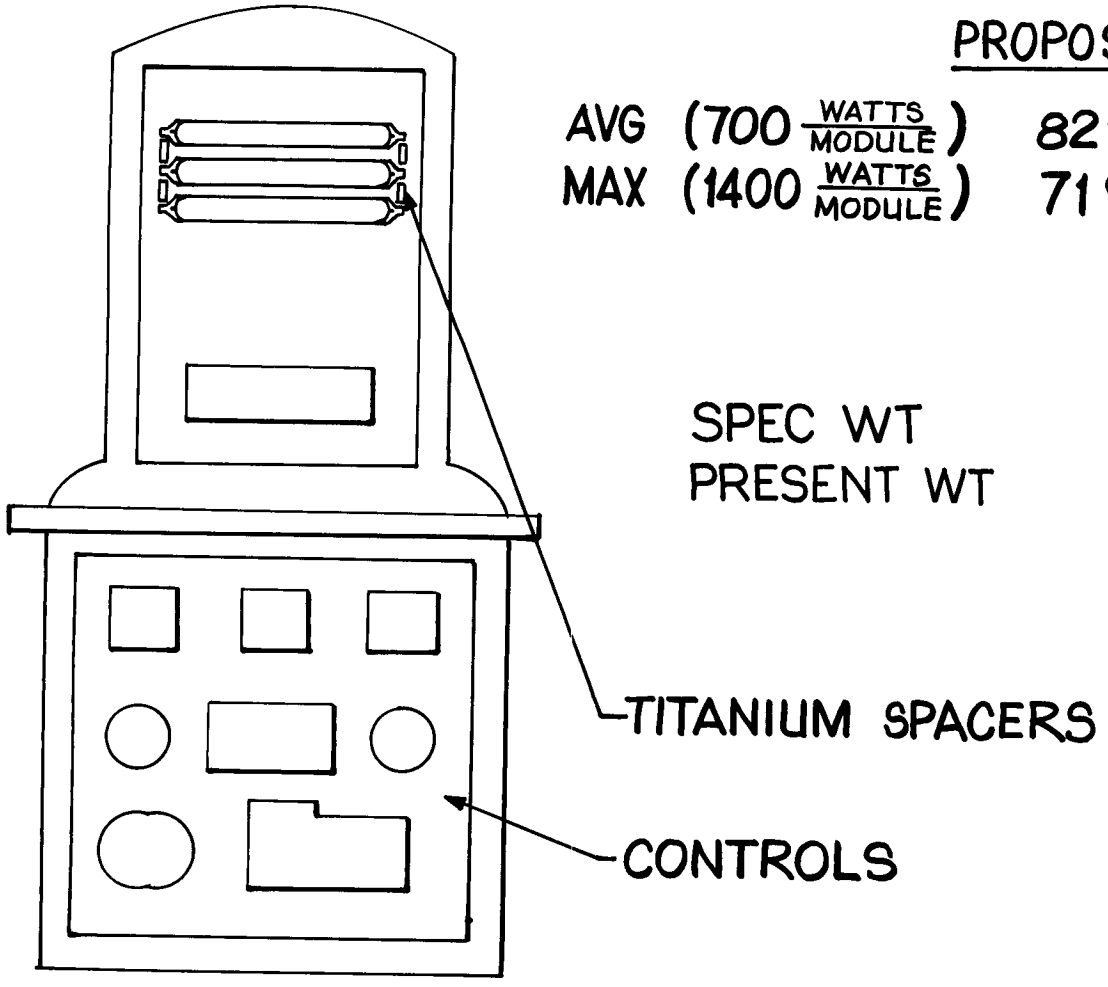
10-62 AP22074

FUEL CELL PERFORMANCE

EFFICIENCY

	PROPOSED	INDICATED
AVG (700 $\frac{\text{WATTS}}{\text{MODULE}}$)	82%	87%
MAX (1400 $\frac{\text{WATTS}}{\text{MODULE}}$)	71%	80%

SPEC WT	245 LBS
PRESENT WT	215 LBS



FUEL CELL - PRATT & WHITNEY

MILESTONES

DESIGN RELEASE - FIRST DEV PROTO

NEW APOLLO FACILITIES COMPLETED

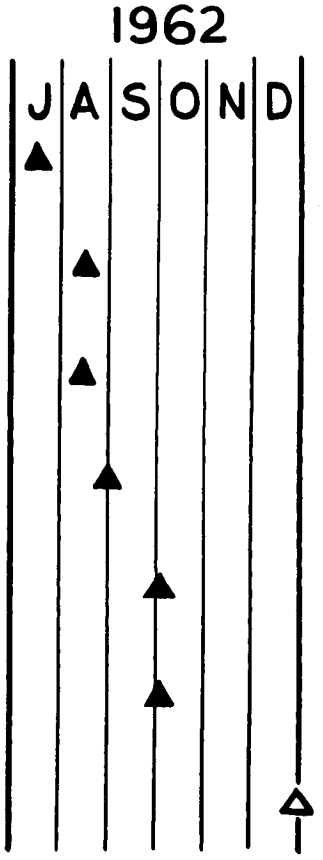
STE DESIGN COMPLETED

FIRST SINGLE-CELL FABRICATED

FIRST DEV MODULE COMPLETED

START COMPLETE MODULE DEV TESTING

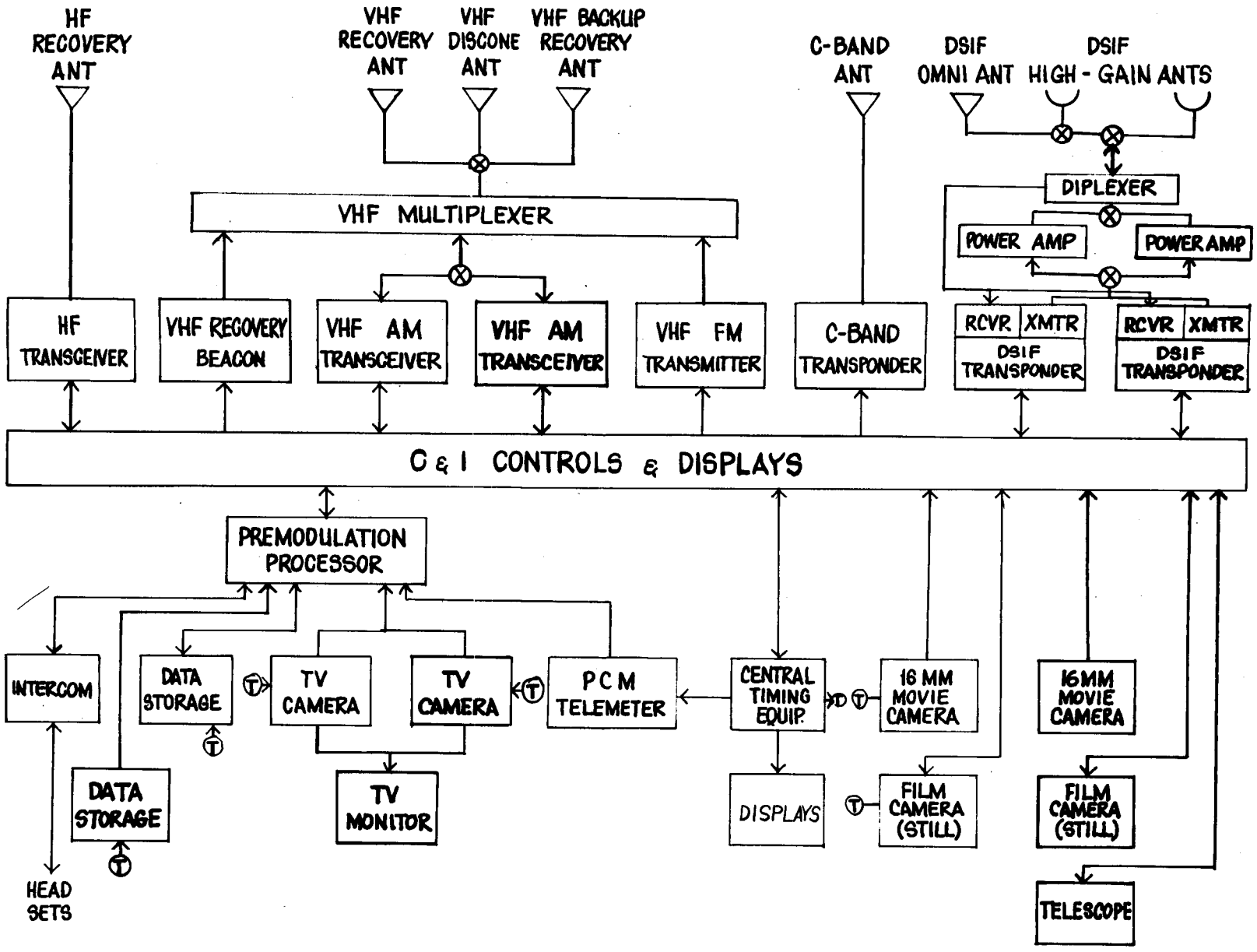
BREADBOARD MODULE DELIVERED TO NAA



COMMUNICATION SYSTEMS

10-62 AP22073

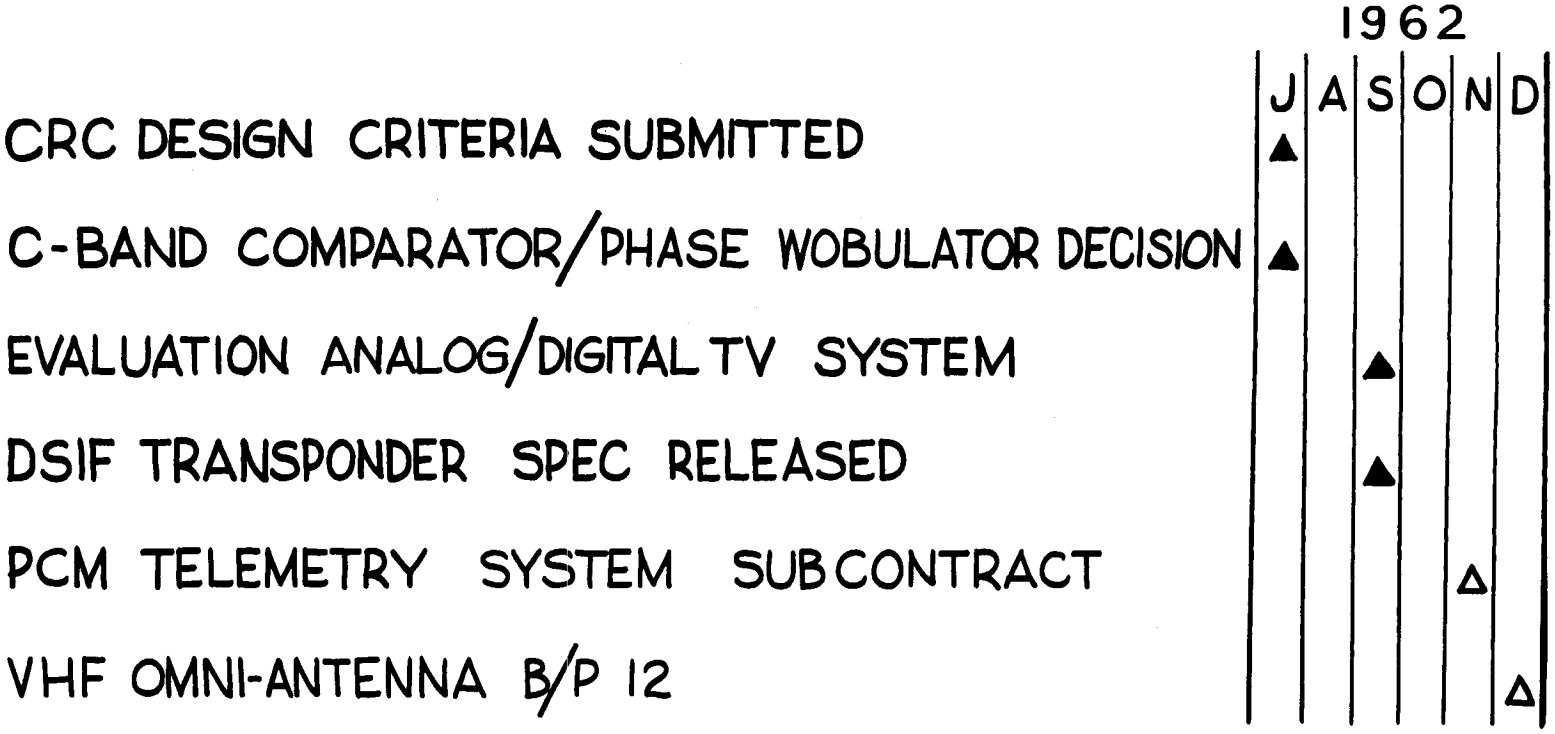
COMMUNICATION SYSTEM



10-62 AP 22072

TELECOMMUNICATIONS - COLLINS

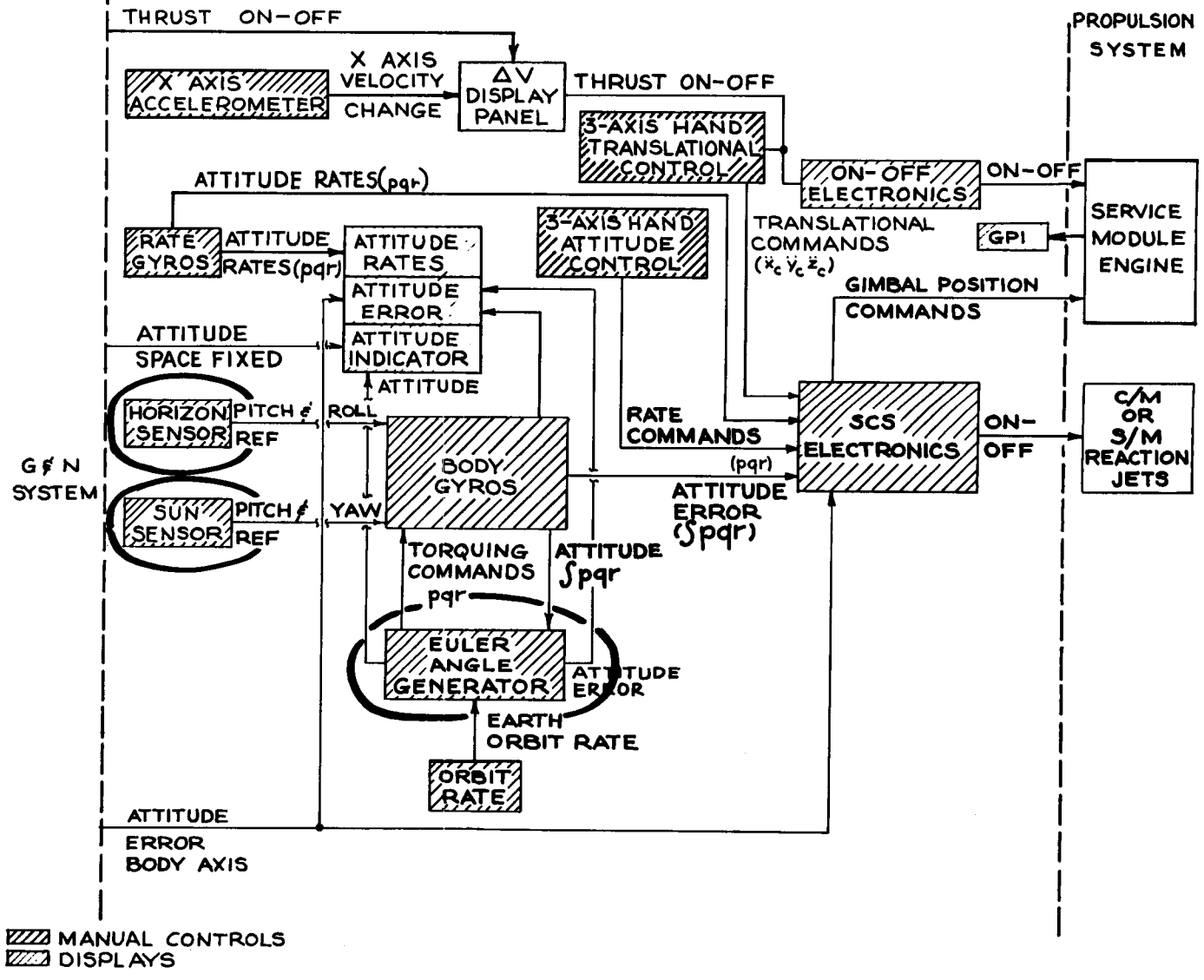
MILESTONES



STABILIZATION & CONTROL

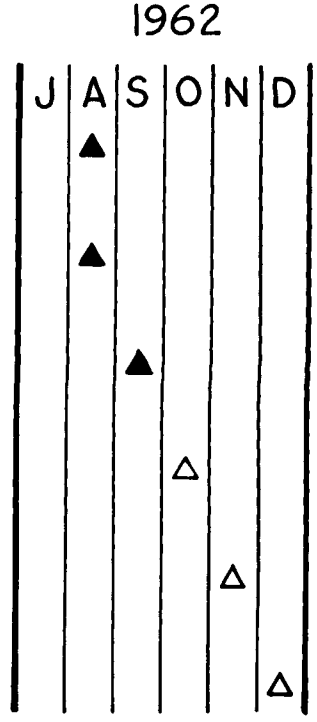
10-62 AP22078

SCS FUNCTIONAL BLOCK DIAGRAM



AP 22111

SCS-MINNEAPOLIS-HONEYWELL
MILESTONES



ATTITUDE REFERENCE TECHNIQUE ESTABLISHED

SCS MODEL SPEC SUBMITTED

GSE MODEL SPEC SUBMITTED

MANUAL CONTROLS FUNCTIONAL MODEL LAYOUT

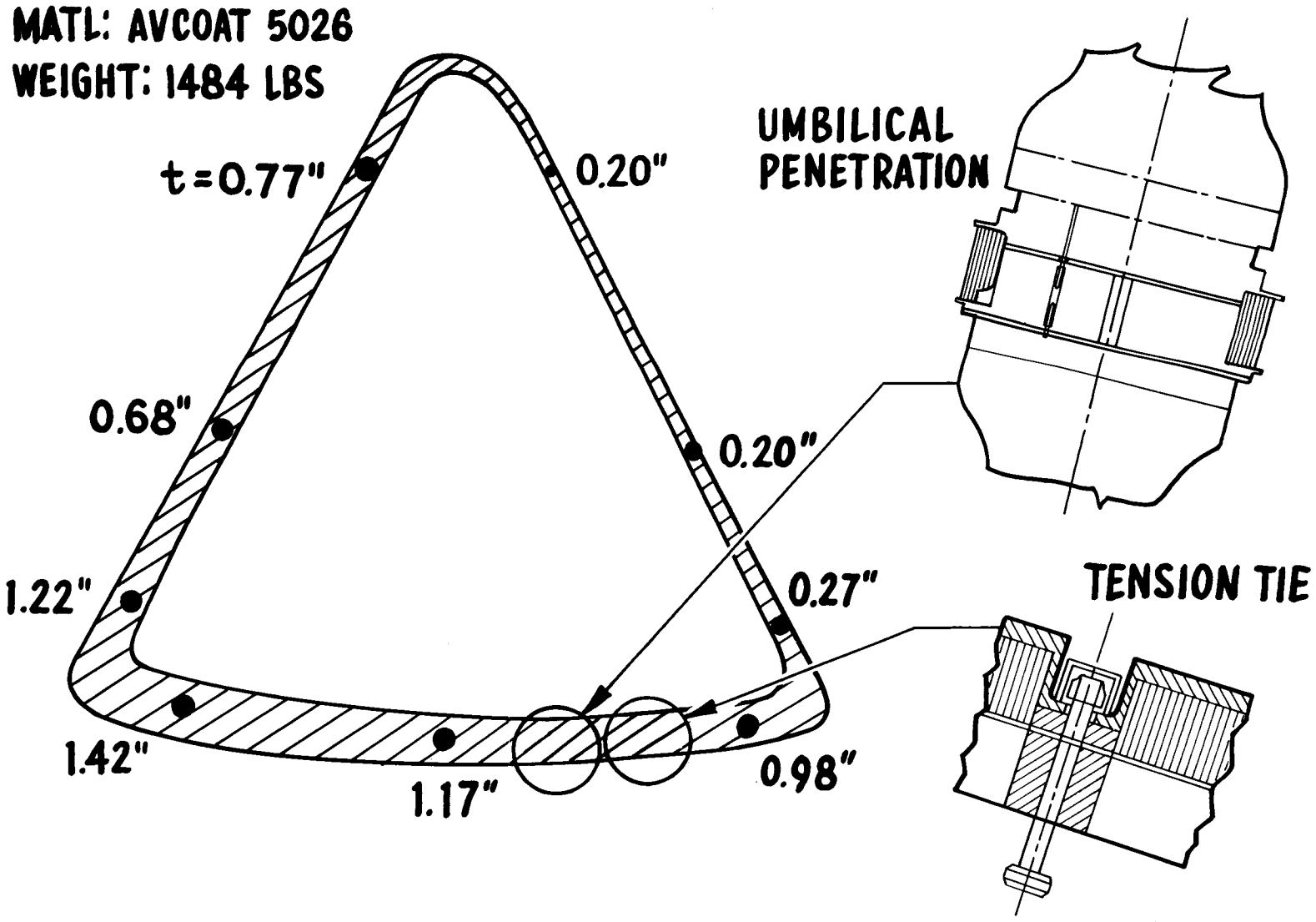
SCS SYSTEM SCHEMATIC RELEASE

B/P SCS FUNCTIONAL MODEL (M-H USE)

HEAT SHIELD & RECOVERY

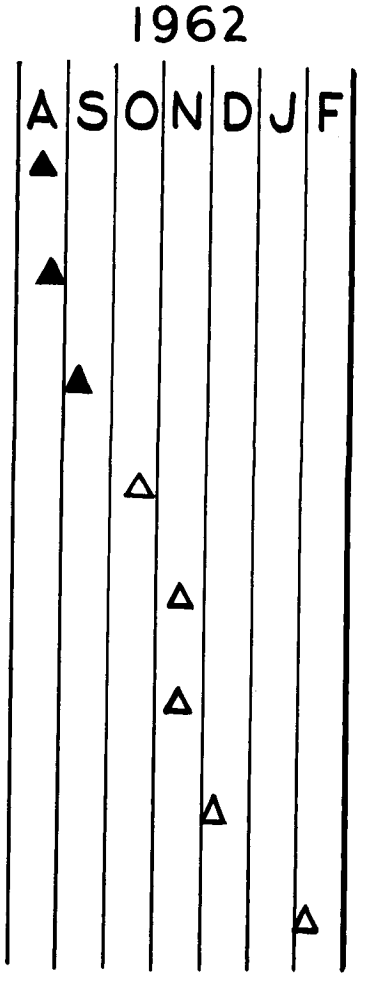
10-62 AP 22077A

ABLATOR THICKNESS REQUIREMENTS



10-62 AP22076

HEAT SHIELD - AVCO
MILESTONES



MATERIALS SCREENING TESTS

FAB MASTER FACILITY TOOLS

FAB LARGE TEST PANELS

DEFINE SUBSTRUCTURE - ABLATOR INTERFACE

MATERIALS POST-SCREENING TESTS

SELECT MATERIAL, DESIGN, & FAB METHODS

LAYOUTS COMPLETED

DWGS RELEASED

PARACHUTE SUBSYSTEM – NORTHROP VENTURA

MILESTONES

DESIGN COMPLETE – MAIN CHUTE ASSY

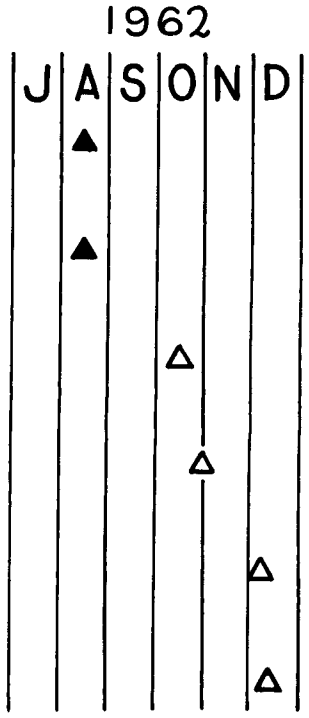
DESIGN COMPLETE – DROGUE CHUTE ASSY

DESIGN COMPLETE – SEQUENCE CONTROLLER

START CLUSTER DROP TESTS

COMPLETE SINGLE MAIN DROP TESTS

START DROGUE DROP TESTS

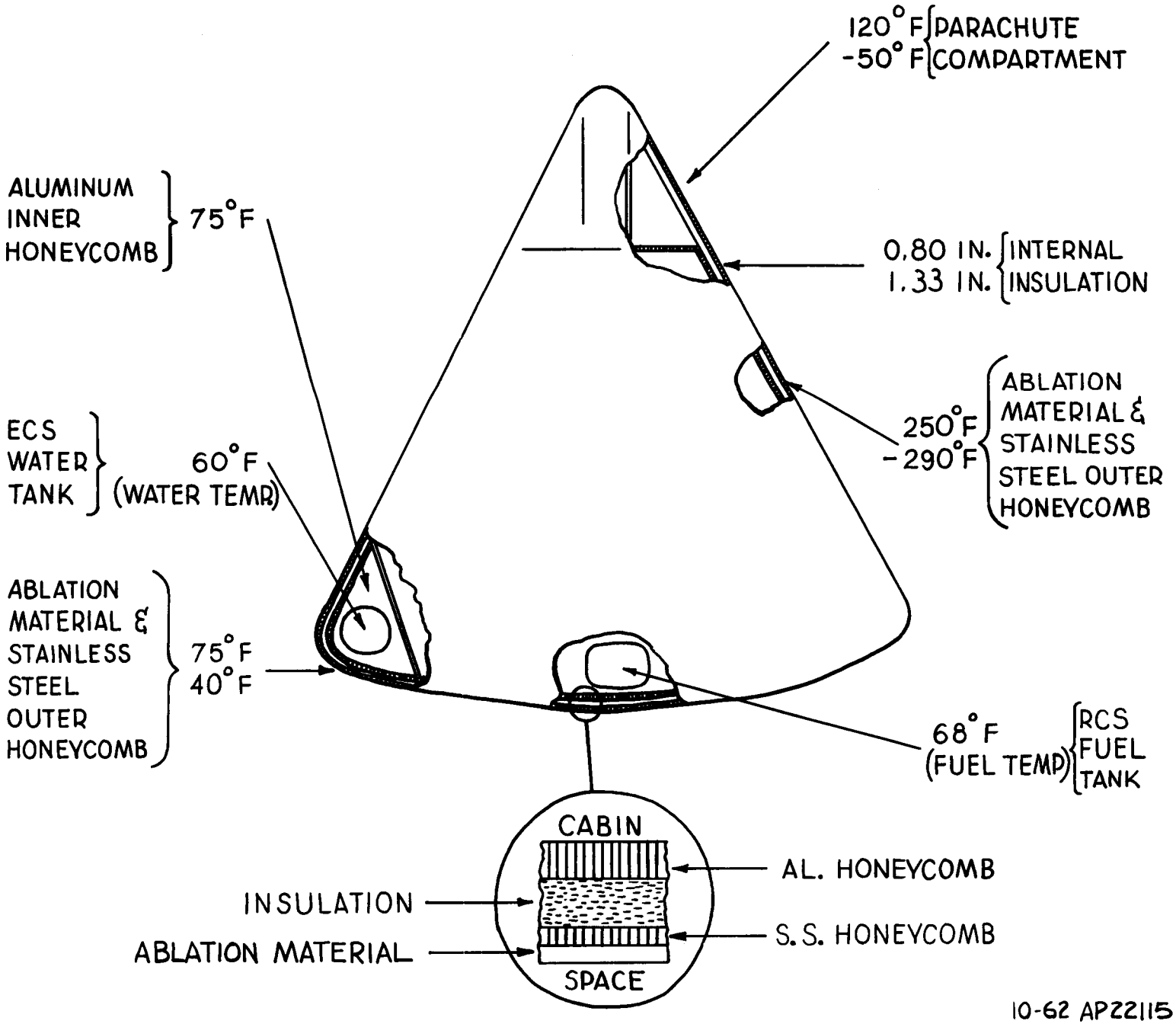


10-62 AP22117

DESIGN CONSIDERATIONS
SPACE ENVIRONMENT

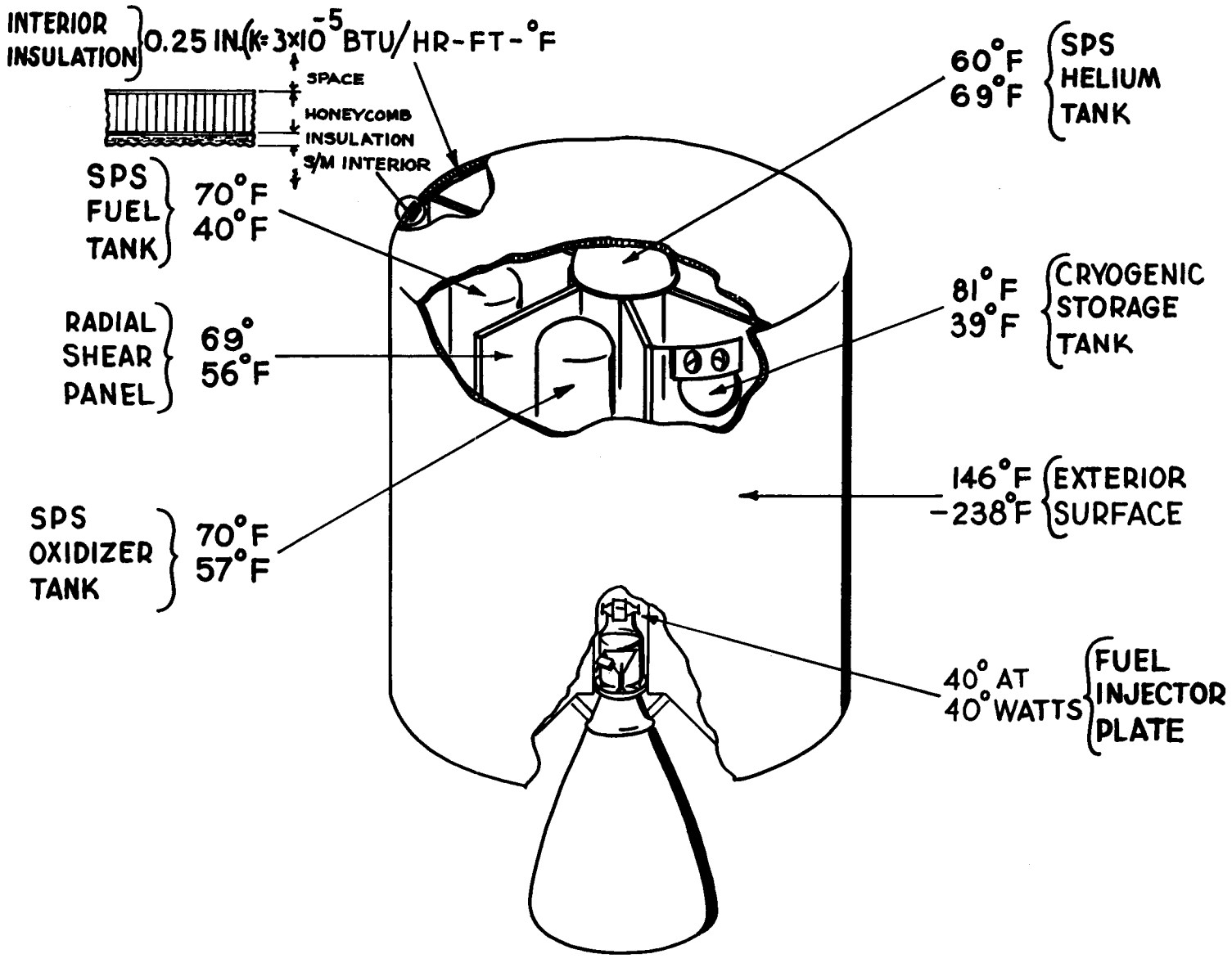
10-62 AP 22114

C/M TEMPERATURES
SPACE ENVIRONMENT



10-62 AP22115

S/M TEMPERATURES
SPACE ENVIRONMENT



10-62 AP 22154

RADIATOR COATING EVALUATION

OSO TEST

BEST SAMPLE	
α	0.16
ϵ	0.92

- 35 SAMPLES OBTAINED
- OPTICAL PROPERTY MEASUREMENT
- SOLAR SIMULATION
- ASCENT HEATING SIMULATED
- 8 SAMPLES SELECTED FOR OSO

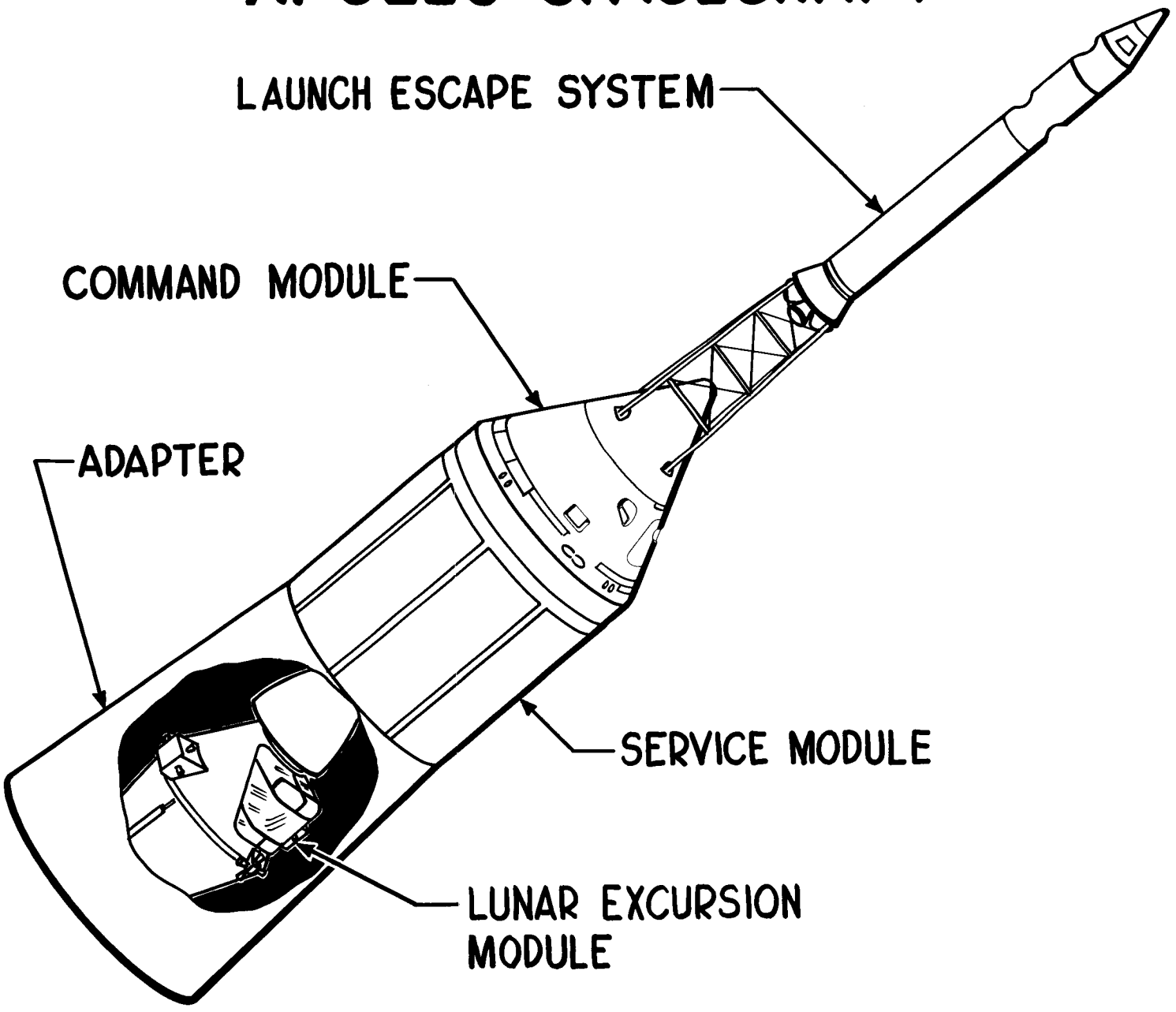
INTEGRATION

OUTLINE

- CONFIGURATION
- WEIGHT STATUS
- PROJECT TESTING
- RELIABILITY
- INTERFACES
- TASKS UNDERWAY

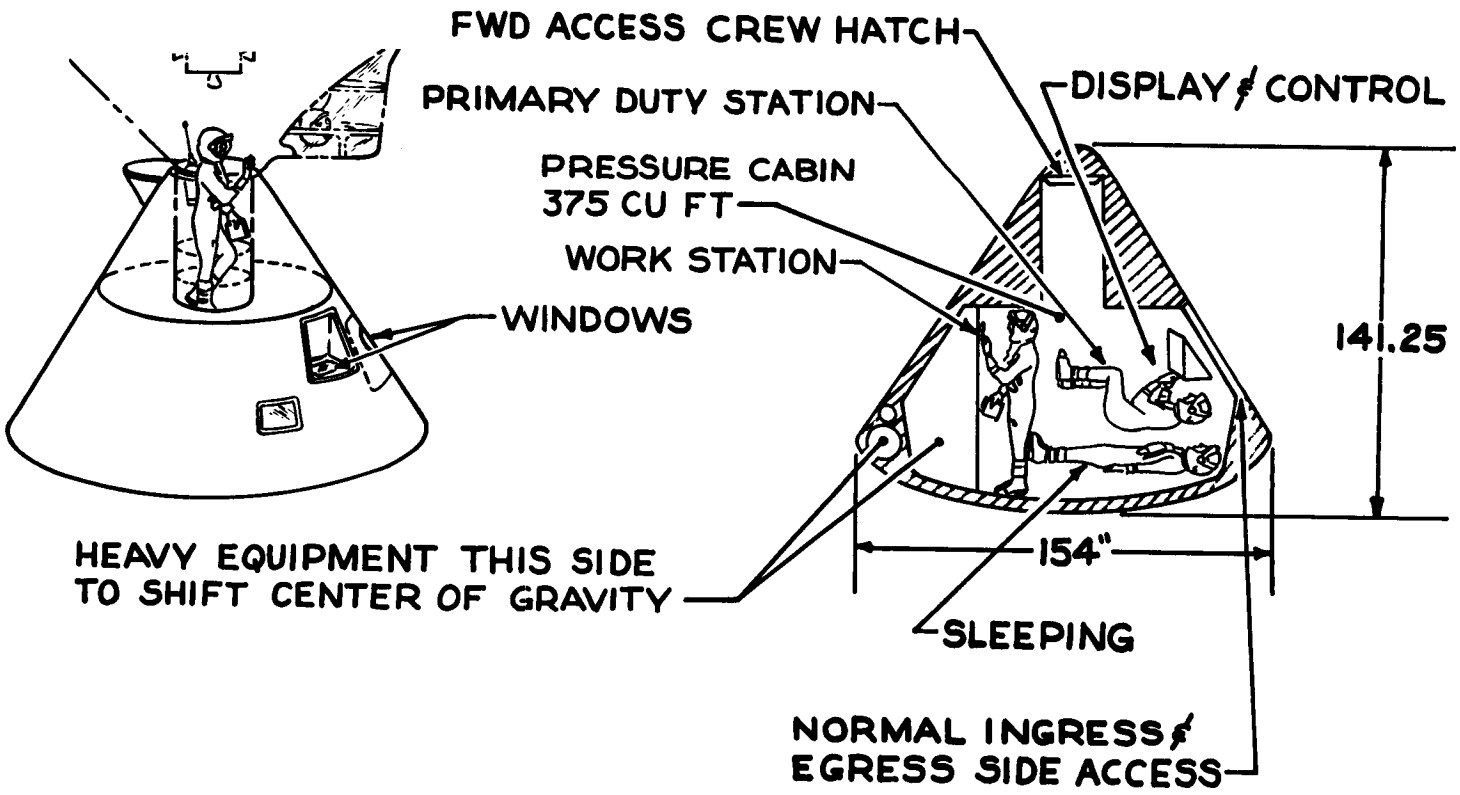
CONFIGURATION

APOLLO SPACECRAFT



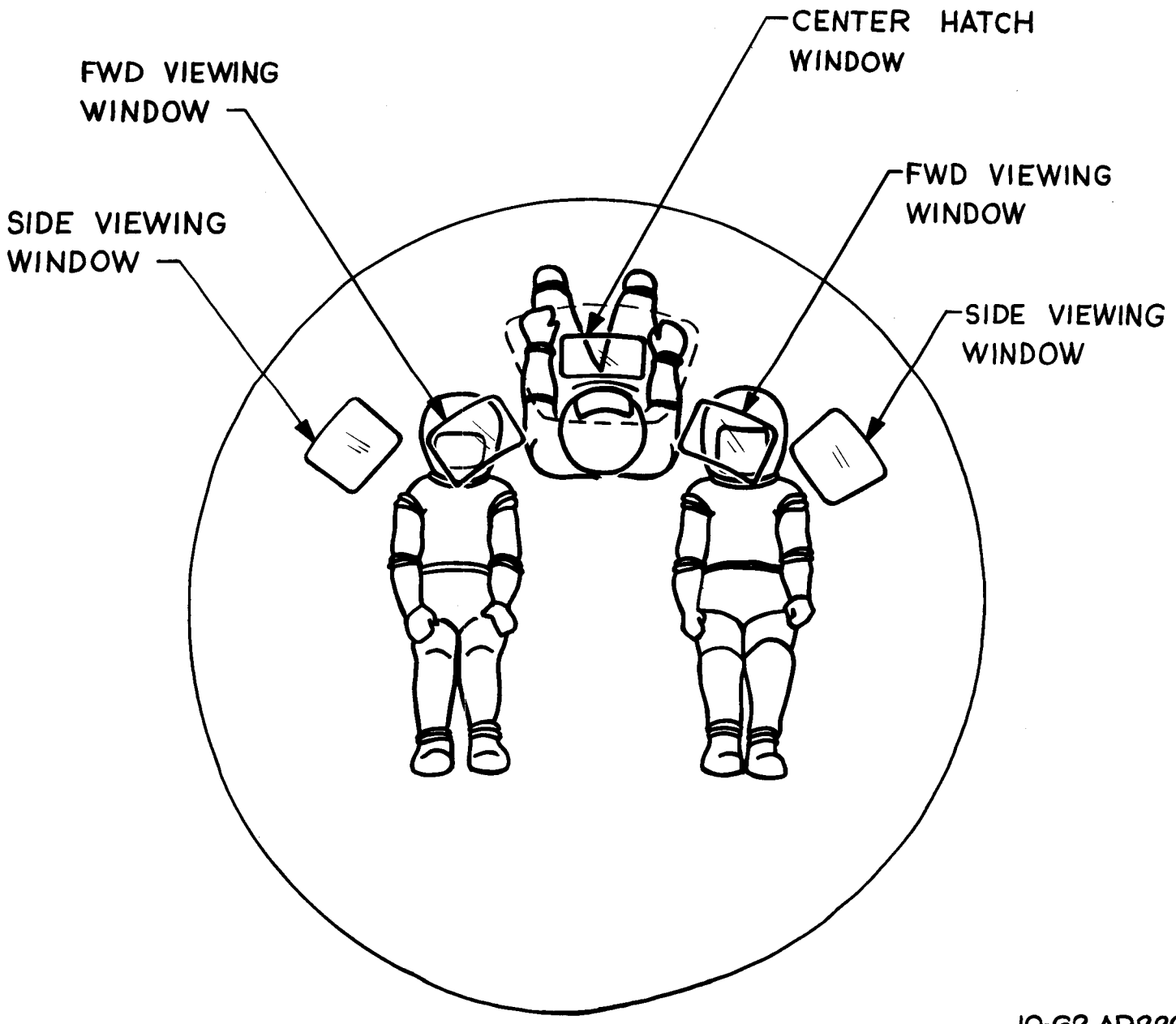
10-62 AP 2 2030

COMMAND MODULE



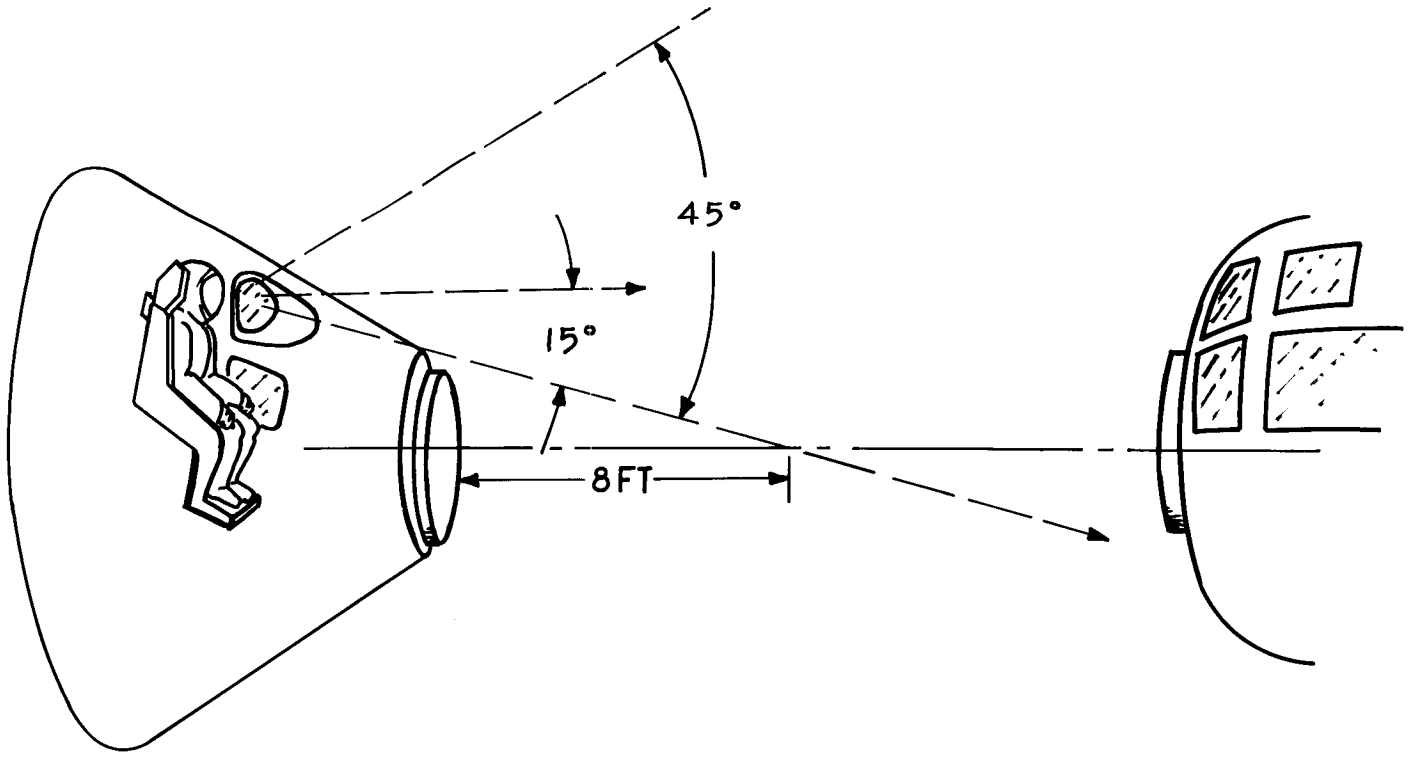
10-62 AP 22031

EXTERNAL VISIBILITY



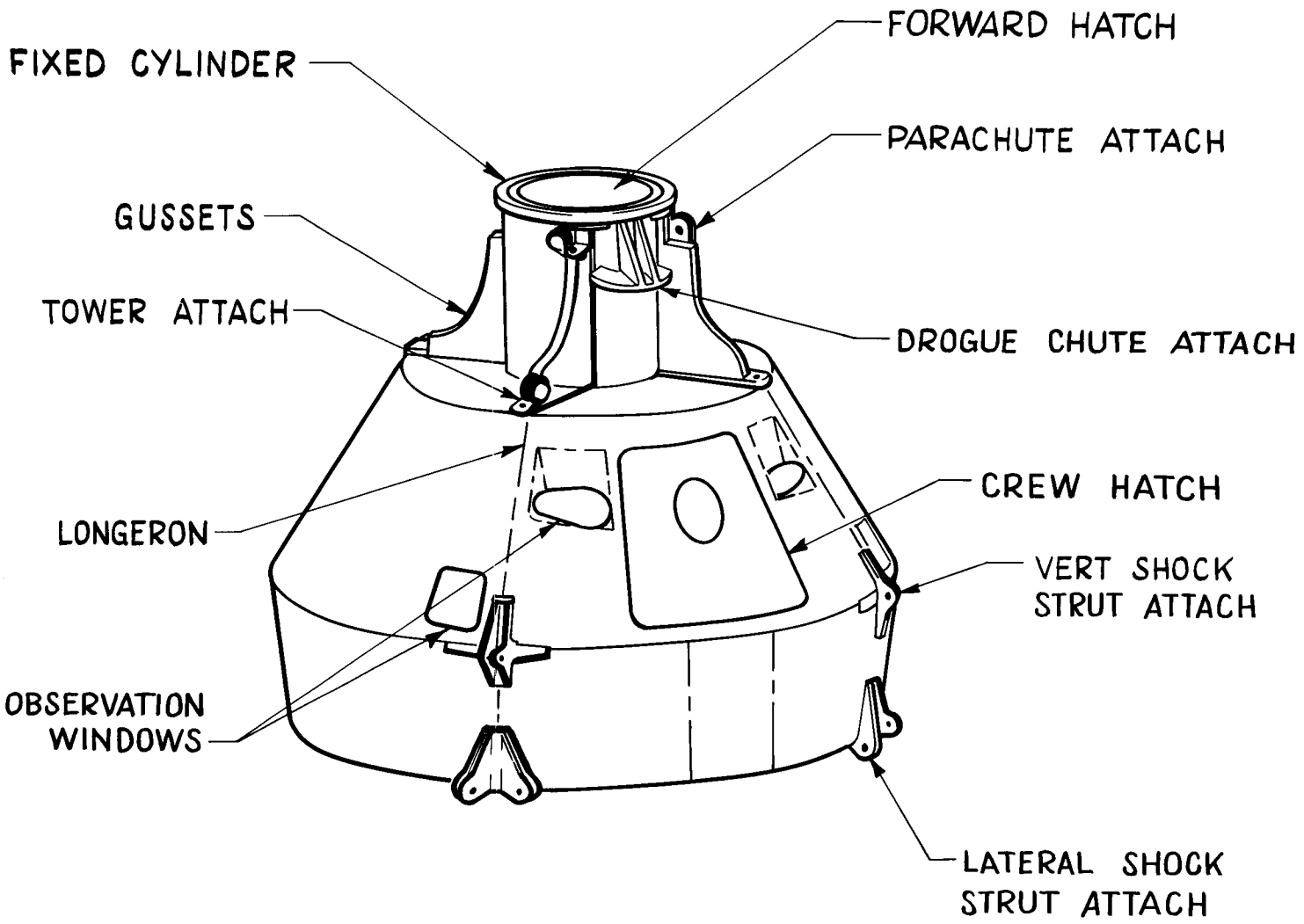
10-62 AP22033

FORWARD VISIBILITY



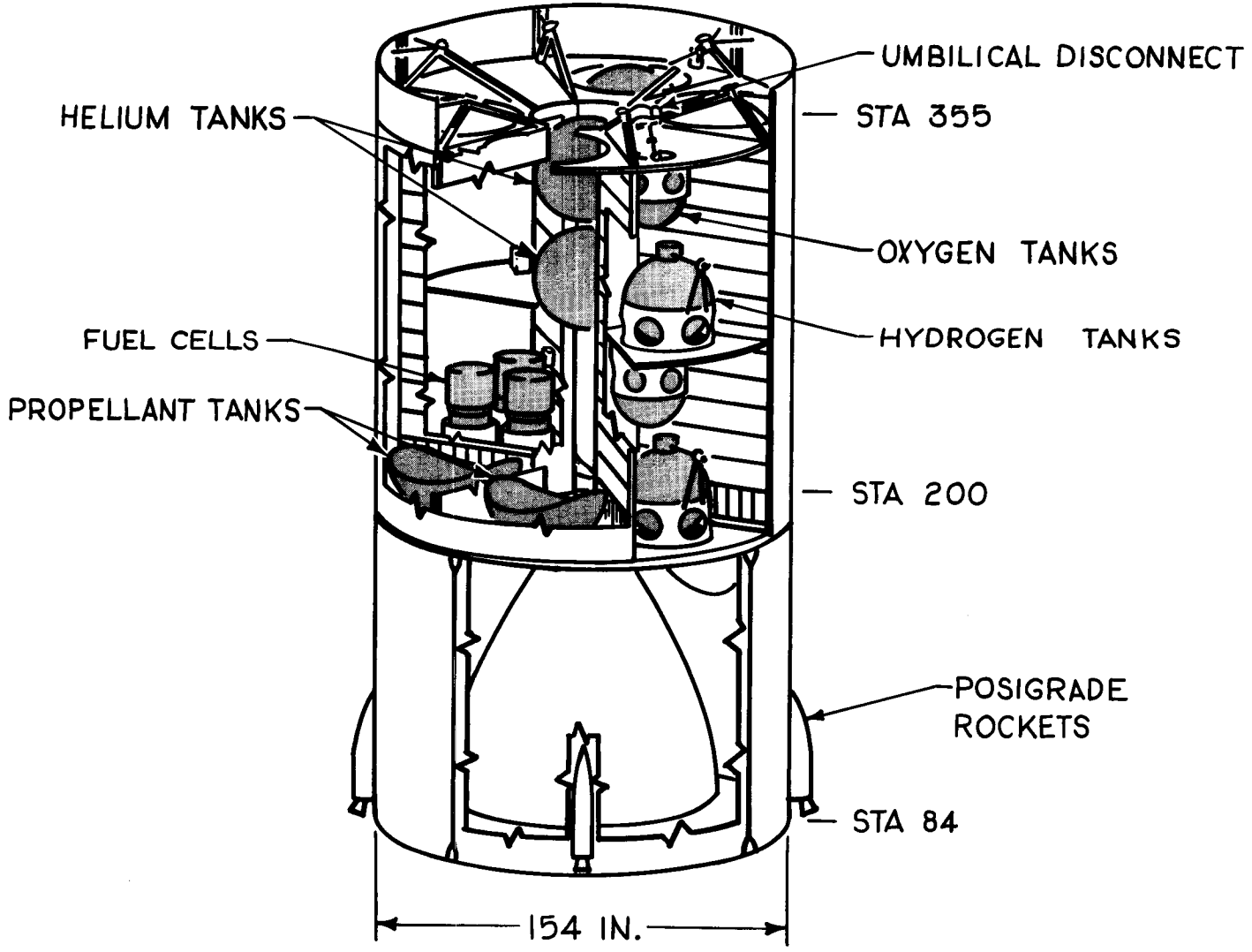
10-62 AP 22034

C/M INNER STRUCTURE



10-62 AP 22035

S/M STRUCTURAL CONFIGURATION



10-62 AP 22036

WEIGHT STATUS

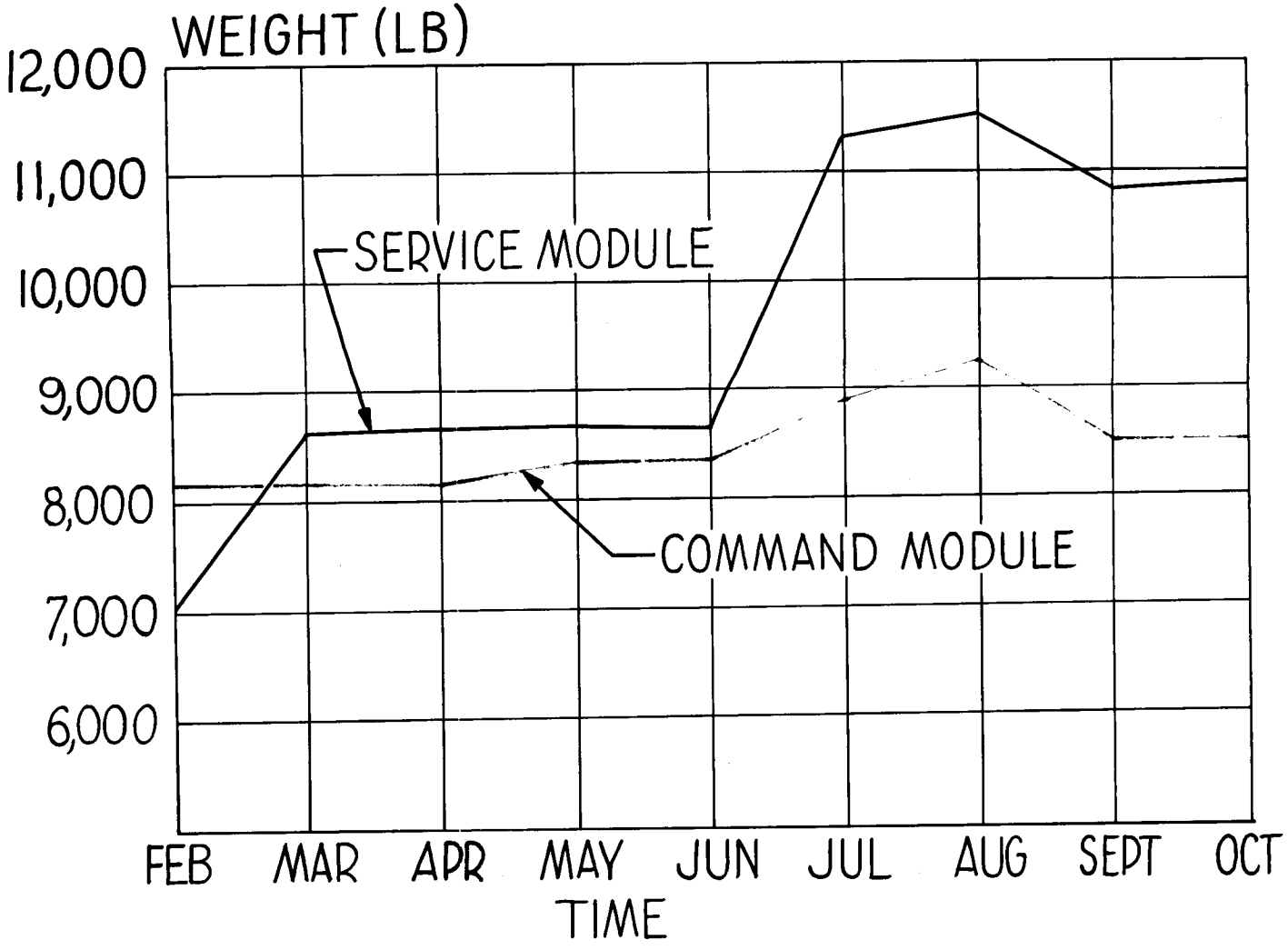
WEIGHT STATUS

	WEIGHT EMPTY	USEFUL LOAD	WEIGHT GROSS
COMMAND MODULE	7378	1362	8740
SERVICE MODULE	8489	39,641	48,130
INJECTED WEIGHT			84,590*
LAUNCH ESCAPE SYSTEM			6500

* BASED ON 10% ΔV MARGIN. TANKS SIZED FOR 45,000 LBS

10-62 AP 22217

WEIGHT HISTORY



10-62 AP22109

PROJECT TESTING

10-62 AP 22041

PARACHUTE DROP-TEST SUMMARY

88.1-FT DIA SINGLE MAIN CANOPY
DROP ALTITUDE = 15,000 FT

TEST NO	REEF (%)	q (LB/FT²)	WEIGHT (LB)	REMARKS
1	9.5	54	3970	SUCCESSFUL BUT NO DATA RECORDED
2*	11	54	3970	PILOT CHUTE BRIDLE FAILED-CHUTE DAMAGED
3	10	60	4600	CHUTE FAILED - HEAVY WEIGHT
4	10	62	4750	2¼OZ CROWN BEEFUP-CHUTE OK-NO DATA
5*	10	66	4720	REPEAT OF No. 4-SUCCESSFUL
6	11	49	4740	REEFING CHANGE - LOW q
7*	11	64	4730	SUCCESSFUL
8	11	89	4600	TEST TO ULTIMATE - CHUTE OK - LOW q

(*) REPEAT OF PREVIOUS DROP

10-62 AP22042

B/P TEST RESULTS

WATER DROPS -NO ATTENUATION

PITCH ORIENTATION	VERTICAL VELOCITY	RECORDED 'g' LEVEL AT CG
5°	13.9 FPS	5 TO 15
5°	17.9 FPS	20 TO 40
15°	17.9 FPS	5 TO 15
15°	17.9 FPS	< 15
15°	21.2 FPS	< 15
15°	24.1 FPS	15 TO 20

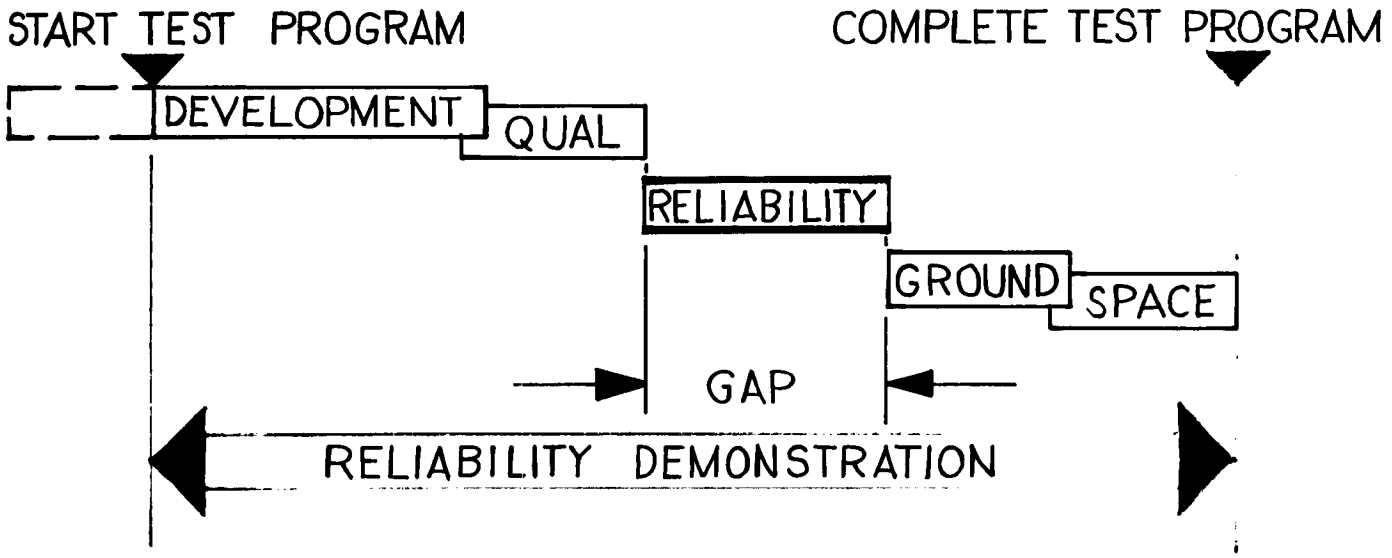
ALL DATA FOR B-25 TESTS
B-1 TEST DATA BEING ANALYZED

RELIABILITY

RELIABILITY DEMONSTRATION PROGRAM

PURPOSE:

TO FILL GAP BETWEEN DEV-QUAL TESTS & SPACECRAFT TESTS

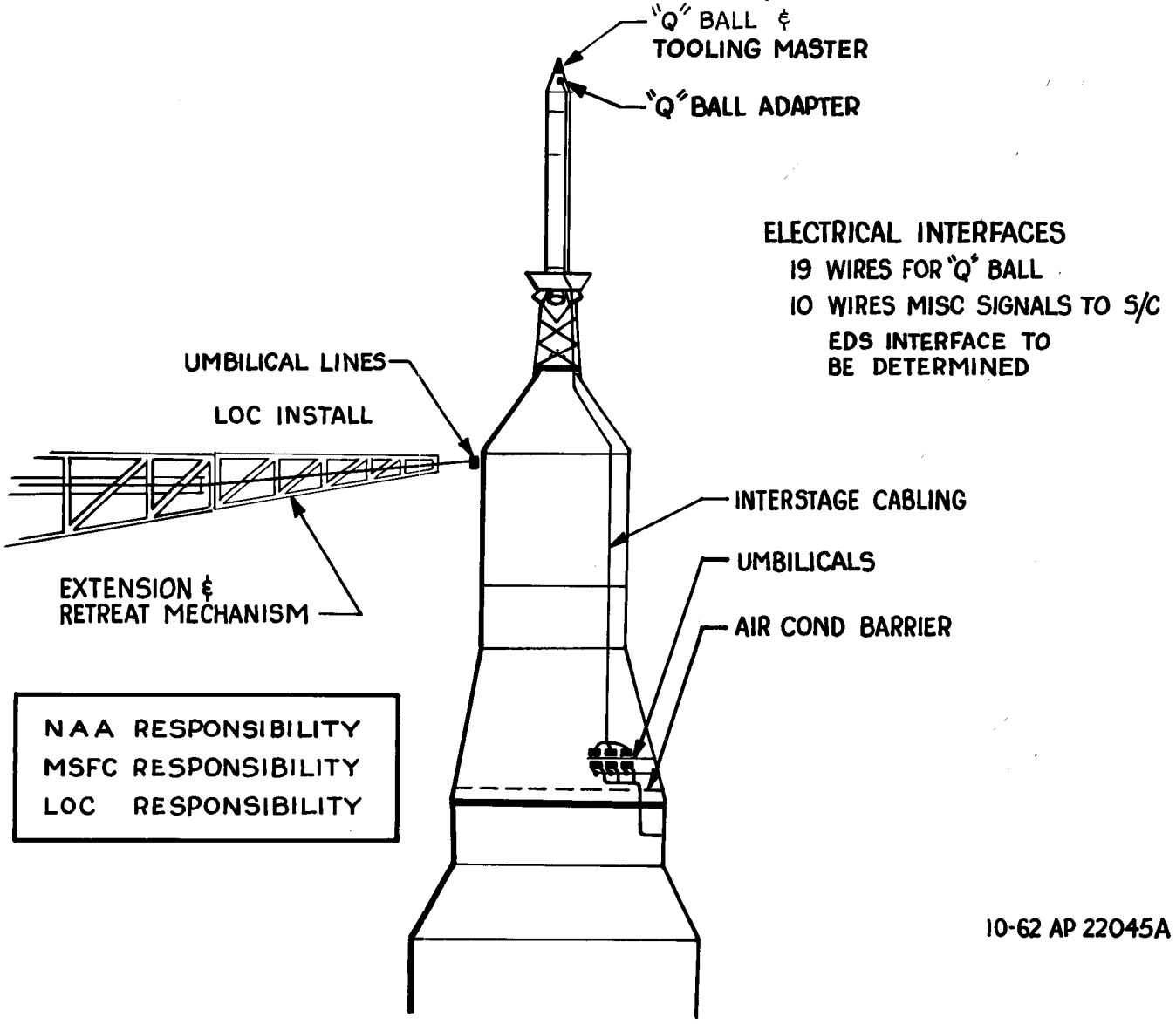


10-62AP22050

INTERFACES

10-62 AP22044

C-I BLOCK II COORDINATION
(SA-5 THRU -10)



10-62 AP 22045A

TASKS UNDERWAY

TASKS UNDERWAY

- LES JET EFFECTS TESTING
- STRUCTURAL DYNAMICS MODEL TESTING
- DOCKING SIMULATION
- PARACHUTE TEST DATA ANALYSIS
- C/M DISPLAY & CONTROL REQUIREMENTS STUDY
- IN-FLIGHT MAINTENANCE & OPERATIONS WORKLOAD ANALYSIS
- 6 DOF ORBITAL RENDEZVOUS SIMULATION
- LOR MISSION SIMULATION PROGRAM REVISION
- ENTRY COOLING ANALYSIS
- C/M RCS ENTRY HEATING TESTS

TASKS UNDERWAY

- C/M STRUCTURAL FINAL DESIGN
- CREW COUCH & ATTENDANT IMPACT ATTENUATION DESIGN
- S/M BASIC STRUCTURAL DESIGN
- C/M RCS ENGINE RELOCATION
- LOR EFFECTS ON RADIATORS & WATER MANAGEMENT
- COLDPLATE & RADIATOR REDESIGN
- PENETRATION OF HEAT SHIELD BY UMBILICAL CONNECTORS
- STABILITY & CONTROL ENTRY ANALYSIS
- OPERATIONAL RADOME REQUIREMENTS
- SCS CONTROL ELECTRONICS CONCEPT & LOGIC DEFINITION

TASKS UNDERWAY

- MERCURY-GEMINI GSE REVIEW
- IMPLEMENTATION OF S.P.A.C.E. CONCEPT
- FIRM MEASUREMENT LISTS
- MISSION ANALYSIS & CREW SAFETY STUDIES
- ENGINEERING DESIGN MOCKUP INSPECTION
- INTERFACE DOCUMENTATION DEVELOPMENT
- COMBINED SYSTEMS SCHEMATICS
- FAILURE MODE ANALYSIS
- RELIABILITY APPORTIONMENT
- SUBCONTRACTOR RELIABILITY TRAINING